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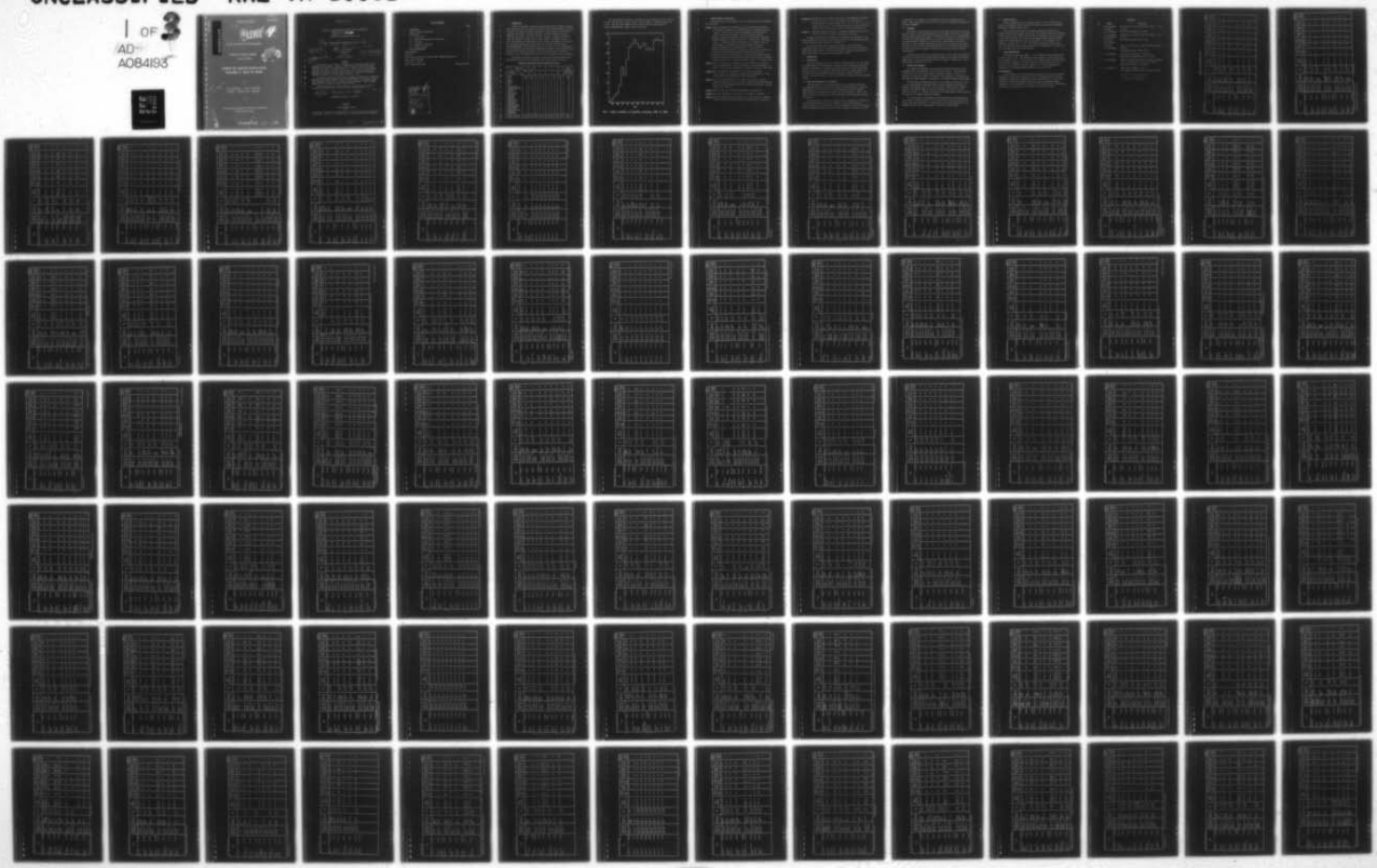

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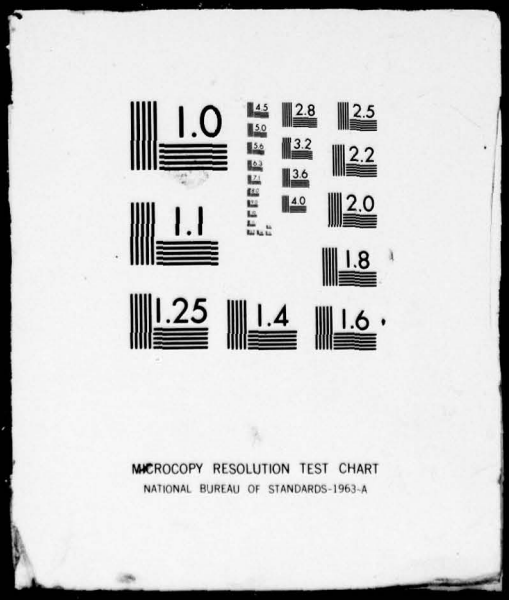

UNLIMITED

LEVEL II

ROYAL AIRCRAFT ESTABLISHMENT

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Technical Report 80001

January 1980

TABLE OF EARTH SATELLITES, VOLUME 3: 1974 TO 1978

by

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H.Hiller, Doreen M.C. Walker

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ROYAL AIRCRAFT ESTABLISHMENT

(9) Technical Report

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(11) Jan 80

SUMMARY

The RAE Table of satellites at present runs to nearly 600 pages, and is divided into four volumes. Volume 1, with satellites launched in the years 1957-1968, was issued in revised form in 1978. Volume 2, covering the years 1969-1973, was issued in revised form early in 1979. Volume 3, with satellites launched in the years 1974-1978, is now issued for the first time and brings together the 60 monthly issues for these years, with appropriate amendments. Satellites launched in 1979 will appear in Volume 4, Part 1.

The present volume lists 607 launches, arranged chronologically, giving the name and international designation of each instrumented satellite and its associated rocket(s), with the date of launch, lifetime (actual or estimated), mass, shape, dimensions and at least one set of orbital parameters. Other fragments associated with a launch are listed, without details.

The main Table, which occupies 203 pages, is prefaced by six pages of introduction and explanation, and followed by a six-page index.

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LIST OF CONTENTS

1 INTRODUCTION

A Table of artificial satellites, giving launch dates, lifetimes, weights, sizes and orbits, has been issued by the Royal Aircraft Establishment since 1958, with yearly revisions and monthly supplements. The launches are listed chronologically, with Volume 1 covering the years 1957-1968, Volume 2 the years 1969-1973, and Volume 3 the years 1974-1978. Volume 1 (originally issued in 1970) was reissued in revised form in 1978[1]. Volume 2 (originally issued in 1974) was reissued in revised form in 1979[2]. Volume 3 now appears for the first time, bringing together the monthly issues of 1974-1978, with more than a thousand amendments, including decay dates up to the end of 1979, revisions of the estimated mass and dimensions of many Russian rockets, and the identification of engines and capsules jettisoned from the recoverable Cosmos satellites. Volume 4, Part 1, covering launches in 1979, will be issued as soon as possible.

The numbers of successful launches of satellites and space vehicles each year between 1974 and 1978 are tabulated below, with national sub-totals.

CENSUS OF SATELLITES AND SPACE VEHICLES 1974-1978

Country of origin \ Year of launch	1957-1968	1969-1973	1974	1975	1976	1977	1978	Total national launches 1957-1978
USSR	314	381	79	85	97	96	87	1139
USA	432	126	13	23	21	15	25	655
Japan	-	4	1	2	1	2	3	13
France	4	2	0	3	0	0	0	9
China	-	2	0	3	2	0	1	8
UK	-	1	0	0	0	0	0	1
USA/Intelsat	6	11	1	2	1	1	2	24
USSR/Intercosmos	-	10	2	2	2	1	1	18
USA/Europe	3	4	0	1	0	3	2	13
USA/UK	3	3	4	0	0	0	0	10
USA/Canada	2	4	0	1	1	0	1	9
USA/Italy	2	1	1	0	0	1	0	5
USA/FRG	-	2	2	0	1	0	0	5
USA/NATO	-	2	0	0	1	1	1	5
USSR/France	-	3	0	1	0	1	0	5
USA/France	1	1	1	1	0	0	0	4
USA/Japan	-	-	-	-	-	2	1	3
USA/Australia	1	1	0	0	0	0	0	2
USA/Indonesia	-	-	-	-	1	1	0	2
France/FRG	-	1	0	0	0	0	0	1
USA/Netherlands	-	-	1	0	0	0	0	1
USA/Spain	-	-	1	0	0	0	0	1
USSR/India	-	-	-	1	0	0	0	1
Total launches	768	559	106	125	128	124	124	1934

Fig 1 below shows the number of launches each year from 1957 to 1978. Between 1957 and 1967 there was a rapid increase, with the number of launches reaching 127 in 1967. Then the trend changed, and from 1968 to 1978 the yearly number of launches remained fairly steady, between 106 and 128.

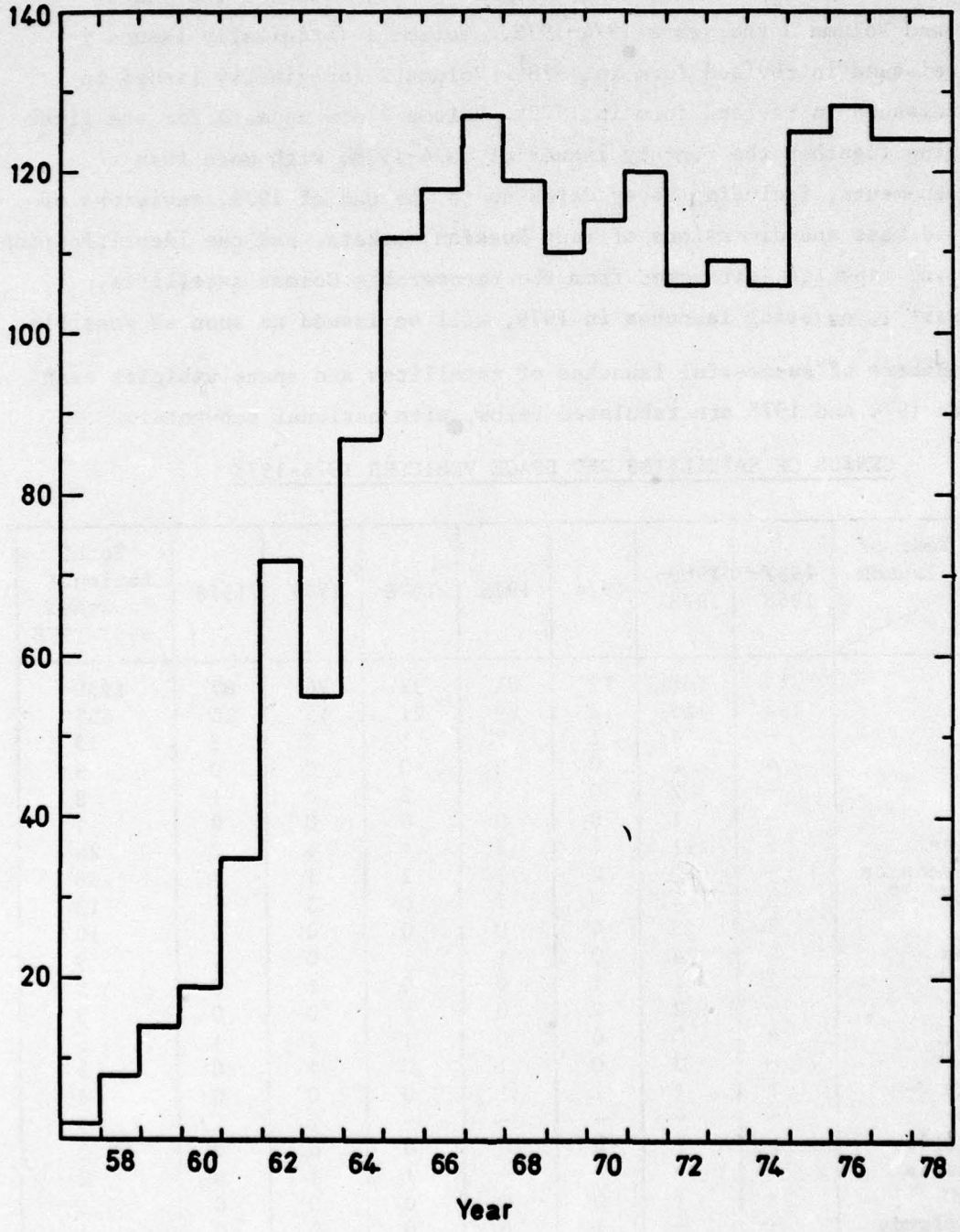

Fig 1 Yearly numbers of satellite launches, 1957 to 1978

2 GUIDE TO TABLE OF SATELLITES

The data given in the main Table, for all satellites other than fragments, are as follows.

Column 1 gives the name of the satellite and its international designation. If the name is unknown, the launching vehicle is indicated in square brackets. Doubtful entries are distinguished by question marks. Letters to the left of Column 1 have the following meanings:

B denotes unmanned satellites which carried live biological specimens.

D denotes satellites no longer in orbit on 1 January 1980. (For fragments, D indicates that all have decayed; 1d indicates that one has decayed; 2d indicates that two have decayed, and so on.)

L denotes satellites with retroreflectors for laser tracking.

M denotes manned satellites; 2M indicates a crew of two at launch; etc.

p indicates that pieces were picked up on Earth after re-entry.

R denotes satellites which returned to Earth and were recovered intact.

r denotes satellites carrying capsules which were successfully recovered.

T denotes satellites still transmitting radio signals on 1 January 1980.

Column 2 gives the launch date, lifetime (actual or estimated), and descent date (if appropriate). The dates are given in days and decimals of a day UT. Thus 1974 May 18.70 means "16h 48m UT (or GMT) on 18 May 1974".

Column 3 gives the shape of the satellite and its mass in kilograms (1 kg = 2.205 lb). Sometimes the shape defies description in a few words and the description given is only approximate.

Column 4 gives the basic dimensions of the satellite in metres. Aerials, paddles carrying solar cells, and other components projecting from the main body are not normally taken into account when giving the size and shape (1 m = 3.281 ft).

Column 5 gives the date for the orbital information in Columns 6-12.

Column 6 gives the inclination of the orbit to the equator, in degrees.

Column 7 gives the nodal period of revolution - the time interval, in minutes, between successive northward equatorial crossings by the satellite.

Columns 8-11 specify the size and shape of the orbit. The quantities tabulated are the semi major axis a , in kilometres; the eccentricity e ; and the perigee and apogee heights $\{a(1 - e) - R\}$ and $\{a(1 + e) - R\}$ respectively, where R is the Earth's equatorial radius, 6378.1 km. (1 km = 0.6214 statute miles = 3281 ft = 0.5396 nautical miles.)

Column 12 gives the argument of perigee - the angle, measured round the orbit, from the northward equatorial crossing to the perigee.

The names of space vehicles (which have escaped from the dominance of the Earth's gravitational field) are given below the table, on the appropriate pages. A separate Table of space vehicles is available[3,4].

The index after the main Table gives the names of the satellites in alphabetical order, with the international designation of each and the page on which details may be found. Satellites which are not Russian or American may be found in the index by referring to the appropriate country.

3 METHODS USED

3.1 Difficulties

The chief difficulty is lack of accurate information about the size, shape and weight of most of the satellites. The majority of launchings are military, and little information is released about these satellites or their final-stage rockets; we have to rely largely on deductions from their visual appearance in the night sky and on identifying previous launches of similar character. In contrast, we have full details of most international satellites and those launched by NASA.

3.2 Names and designations of satellites

The names given by the launching authorities are indicated when known, For unnamed United States Air Force satellites, the launch vehicle is given in square brackets: the lists issued by the United Nations have been useful in identifying the launch vehicles and orbits for these satellites. Some of the names are given as initials only, and the meanings of these acronyms are given as footnotes.

The international designation of each satellite launching is allocated by the World Warning Agency on behalf of COSPAR. But the identification of particular pieces in a multiple launch has often depended on visual observations, since an experienced visual observer can often recognize the species of rocket

or satellite he is looking at and distinguish between the satellite and its rocket. Small pieces which are, as far as is known, not instrumented satellites, are called fragments.

3.3 Lifetimes

The orbits of most satellites contract slowly under the action of air drag, and the severity of the drag determines their lifetimes, which can be estimated[5] from the orbital decay rates (unless the satellites are swept up as space-rubbish, or suffer other major perturbations). The decay rate depends on air density, and the density depends critically on solar activity, which cannot be accurately predicted. So most lifetime estimates are likely to be in error by 10% or more; if solar activity in future cycles should decline to the low levels prevalent in the late 17th century, lifetimes of 20-50 years given here would be seriously underestimated.

For some of the satellites in high-eccentricity orbits, such as the Molniya satellites and rockets, the lifetimes depend primarily on lunisolar perturbations rather than air drag, and have been estimated by numerical integration of these perturbations, as described in Ref 5.

3.4 Weights and dimensions

The weights and dimensions of the satellites come from Spacewarn launch telegrams, NASA Press Releases, and press and radio reports. Some indication of the accuracy is given by the number of significant figures. Often it is difficult to define the 'length' or 'diameter' when components of irregular size and shape are joined together, and dimensions are therefore sometimes approximate.

For satellites of unknown mass and size, the average cross-sectional area S can be approximately determined from the average brightness when observed visually; the mass/area ratio m/S can be obtained from the rate of change of orbital period and the known air density at heights near perigee, to give a value for the mass m. Many of our values for the dimensions of Russian rockets are based on the detailed studies by Sheldon[6].

We hope that most of the weights and dimensions given with question marks are accurate to within a factor of 1.5, *ie* that the real values are between 2/3 and 3/2 times the value given. It seemed better to give some indication of the weights and sizes, even if approximate, rather than to leave blanks.

3.5 Orbital accuracy

Orbital information has come from many sources. Most of the orbits are based on the elements issued by the United States Air Force, and the remainder come mainly from NASA and RAE orbits.

The accuracy of the orbits varies greatly between one satellite and another, and no detailed guide can be given. Most orbits, however, are believed to have an error (sd) of about 0.02° in orbital inclination, 0.02 min in period, 2 km in semi major axis, 5 km in perigee and apogee heights (when the apogee height is less than 2000 km), 0.001 in eccentricity e , and perhaps 3° in argument of perigee (if e > 0.02). Some orbits are much more accurate than this, and some, particularly those with eccentricity exceeding 0.3 or with very short lifetimes, may be much less accurate.

4 RADIO TRANSMISSIONS

A satellite receives the symbol T if it transmits radio signals during its first days in orbit. The cessation of radio signals is rarely publicized, so the removal of the T is often based on the estimate that the *average* active life for radio transmission is about 2½ years for Soviet satellites and 7 to 8 years for US satellites. The most complete list of radio frequencies of satellites is in *Telecommunication Journal*, Vol 44, No.2 (1977)

Acknowledgments

We are indebted to the various sources mentioned in the text for information about the satellites, and most of all to the North American Air Defense Command for having issued comprehensive orbital information for so many years. We thank G.E. Perry for providing the descent times of recoverable Cosmos satellites. We also thank Mrs L.R. Ashton for her essential work in maintaining and updating our files of data on the 11000 satellites in the Table.

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TABLE OF EARTH SATELLITES

Year of launch 1974

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 628	1974-01A	1974 Jan 17.42 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1974 Jan 18.0	82.96	104.87	7365	958	1016	0.004	299
	Cosmos 628 rocket	1974-01B	1974 Jan 17.42 600 years	Cylinder 2200?	7.4 long 2.4 dia	1974 Jan 19.4	82.95	104.75	7359	959	1003	0.003	279
D	Skynet 2A	1974-02A	1974 Jan 19.07 6 days 1974 Jan 25	Cylinder 435 full 235 empty	1.33 long 1.90 dia	1974 Jan 20.7	37.60	121.48	8129	96	3406	0.204	171
D	Skynet 2A second stage	1974-02B	1974 Jan 19.07 1 day 1974 Jan 20	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1974 Jan 19.7	28.70	88.05	6562	183	184	0	42
D	Fragments	1974-02C,D											
D R	Cosmos 629	1974-03A	1974 Jan 24.63 11.66 days 1974 Feb 5.29	Sphere-cylinder 5900?	5.9 long 2.4 dia	1974 Jan 25.1	62.81	89.35	6621	197	289	0.007	55
D	Cosmos 629 rocket	1974-03B	1974 Jan 24.63 8.20 days 1974 Feb 1.83	Cylinder 2500?	7.5 long 2.6 dia	1974 Jan 26.2	62.81	89.13	6610	191	273	0.006	52
D	Capsule	1974-03D	1974 Jan 24.63 16 days 1974 Feb 9	Ellipsoid 200?	0.9 long 1.9 dia	1974 Feb 5.3	62.81	89.21	6614	195	277	0.006	-
D	Fragment	1974-03C											

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 630 †	1974-04A	1974 Jan 30.46	Sphere-cylinder	6.5 long?	1974 Jan 31.6	72.84	90.02	6653	203	346	0.011	65
R			13.7 days	6300?	2.4 dia	1974 Feb 5.4	72.85	89.74	6639	179	342	0.012	52
			1974 Feb 13.2										
D	Cosmos 630 rocket	1974-04B	1974 Jan 30.46	Cylinder	7.5 long	1974 Jan 31.3	72.84	89.92	6648	200	339	0.010	66
			15.45 days	2500?	2.6 dia								
			1974 Feb 14.91										
D	Cosmos 630 engine*	1974-04F	1974 Jan 30.46	Cone	1.5 long?	1974 Feb 13.1	72.82	88.87	6596	162	273	0.008	50
			17.07 days	600?	2 dia?								
			1974 Feb 16.53	Full									
D	Fragments	1974-04C-E											
	Cosmos 631	1974-05A	1974 Feb 6.03	Cylinder + paddles?	2 long?	1974 Feb 9.5	74.04	95.31	6911	521	545	0.002	8
			10 years	900?	1 dia?								
	Cosmos 631 rocket	1974-05B	1974 Feb 6.03	Cylinder	7.4 long	1974 Feb 10.2	74.04	95.19	6905	511	543	0.002	17
			10 years	2200?	2.4 dia								
D	Fragments	1974-05C-E											
D	Cosmos 632 †	1974-06A	1974 Feb 12.38	Sphere-cylinder	6.5 long?	1974 Feb 14.4	65.00	89.29	6618	176	303	0.010	60
R			13.9 days	6300?	2.4 dia								
			1974 Feb 26.3										
D	Cosmos 632 rocket	1974-06B	1974 Feb 12.38	Cylinder	7.5 long	1974 Feb 14.4	65.01	88.86	6597	174	263	0.007	53
			5 days	2500?	2.6 dia								
			1974 Feb 17										
D	Cosmos 632 engine **	1974-06E	1974 Feb 12.38	Cone	1.5 long?	1974 Feb 25.4	65.01	90.23	6665	192	382	0.014	-
			26 days	600?	2 dia?								
			1974 Mar 10	Full									
D	Fragments	1974-06C,D											

* 1974-04F ejected from 1974-04A on 1974 Feb 12

† Manoeuvrable

** 1974-06E ejected from 1974-06A on 1974 Feb 25

Year of launch 1974 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Titan 3B Agena D]	1974-07A	1974 Feb 13.75 32 days 1974 Mar 17	Cylinder 300?	8 long? 1.5 dia	1974 Feb 15.1	110.44	89.78	6642	134	393	0.020	149
T?	Tansei 2* [Mu 3C]	1974-08A	1974 Feb 16.21 9 years	26-sided polyhedron? 56	0.75 long? 0.71 dia?	1974 Feb 17.5	31.23	121.60	8137	284	3233	0.181	102
	Tansei 2 rocket	1974-08B	1974 Feb 16.21 10 years	Sphere-cone 230?	2.33 long 1.14 dia	1974 Feb 17.5	31.22	121.92	8151	281	3264	0.183	103
D	San Marco 4**	1974-09A	1974 Feb 18.42 806 days 1976 May 4	Sphere 164	0.71 dia	1974 Feb 22.6 1975 May 1.0	2.92 2.92	95.89 93.55	6949 6835	231 235	910 678	0.049 0.032	342 -
D	San Marco 4 rocket	1974-09B	1974 Feb 18.42 111.53 days 1974 Jun 9.95	Cylinder 24	1.50 long 0.46 dia	1974 Feb 23.6	2.90	95.69	6939	233	889	0.047	357
D	Cosmos 633	1974-10A	1974 Feb 27.47 219.01 days 1974 Oct 4.48	Ellipsoid 400?	1.8 long 1.2 dia	1974 Mar 1.1	70.99	92.17	6759	271	491	0.016	74
D	Cosmos 633 rocket	1974-10B	1974 Feb 27.47 103.97 days 1974 Jun 11.44	Cylinder 1500?	8 long 1.65 dia	1974 Mar 1.1	70.99	92.06	6753	264	486	0.016	72

* Japanese satellite.

** Italian satellite.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Meteor 16	1974-11A	1974 Mar 5.49 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1974 Mar 9.3	81.23	102.23	7241	832	894	0.004	249
	Meteor 16 rocket	1974-11B	1974 Mar 5.49 400 years	Cylinder 1440	3.8 long 2.6 dia	1974 Mar 9.5	81.24	102.26	7243	805	924	0.008	206
D	Cosmos 634	1974-12A	1974 Mar 5.67 217.79 days 1974 Oct 9.46	Ellipsoid 400?	1.8 long 1.2 dia	1974 Mar 7.3	70.92	92.18	6759	271	491	0.016	77
D	Cosmos 634 rocket	1974-12B	1974 Mar 5.67 103.64 days 1974 Jun 17.31	Cylinder 1500?	8 long 1.65 dia	1974 Mar 8.2	70.92	92.04	6752	272	476	0.015	78
D	Fragment	1974-12C											
T	Miranda*	1974-13A	1974 Mar 9.10 150 years	Box + 2 panels 93	0.82 long 0.66 square 2.56 span	1974 Mar 13.4	97.81	101.23	7193	714	916	0.014	194
	Miranda rocket	1974-13B	1974 Mar 9.10 60 years	Cylinder 24	1.50 long 0.46 dia	1974 Mar 25.7	97.82	101.23	7193	713	917	0.014	158
	Fragments	1974-13C,D											
D R	Cosmos 635	1974-14A	1974 Mar 14.44 11.79 days 1974 Mar 26.23	Sphere-cylinder 5900?	5.9 long 2.4 dia	1974 Mar 16.4	72.83	89.82	6643	204	326	0.009	62
D	Cosmos 635 rocket	1974-14B	1974 Mar 14.44 10.73 days 1974 Mar 25.17	Cylinder 2500?	7.5 long 2.6 dia	1974 Mar 16.9	72.83	89.53	6629	200	301	0.008	56
D	Capsule**	1974-14E	1974 Mar 14.44 23.69 days 1974 Apr 7.13	Ellipsoid 200?	0.9 long 1.9 dia	1974 Mar 19.2	72.83	89.74	6639	203	319	0.009	57
D	Fragments	1974-14C,D											

*UK technological satellite, known as X4 before launch.

** 1974-14E ejected from 1974-14A about 1974 Mar 18

Year of launch 1974 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	[Thor Burner 2]	1974-15A	1974 Mar 16.34 80 years	12-sided frustum 195	1.64 long 1.31 to 1.10 dia	1974 Mar 16.9	98.94	101.54	7208	782	877	0.007	243
	Burner 2 rocket	1974-15B	1974 Mar 16.34 60 years	Sphere-cone 66	1.32 long 0.94 dia	1974 Mar 17.3	98.94	101.65	7213	784	886	0.007	238
D	Cosmos 636	1974-16A	1974 Mar 20.36 13.9 days 1974 Apr 3.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1974 Mar 21.3 1974 Mar 21.5	65.02 65.02	90.02 89.26	6654 6616	165 167	386 309	0.017 0.011	70 68
R													
D	Cosmos 636 rocket	1974-16B	1974 Mar 20.36 4.34 days 1974 Mar 24.70	Cylinder 2500?	7.5 long 2.6 dia	1974 Mar 20.5	65.04	89.88	6647	168	370	0.015	70
D	Cosmos 636 engine*	1974-16F	1974 Mar 20.36 16 days 1974 Apr 5	Cone 600? Full	1.5 long? 2 dia?	1974 Apr 3.5	65.03	90.57	6681	184	422	0.018	11
D	Fragments	1974-16C-E											
	Cosmos 637	1974-17A	1974 Mar 26.57 >million years	-	-	1974 Mar 26.6 1974 Mar 26.6 1974 Sep 1.0	51.54 49.73 0.25	88.52 647.52 1425.8	6582 24797 41963	178 226 35390	230 36611 35779	0.004 0.734 0.005	158 0 -**
D	Cosmos 637 launcher	1974-17B	1974 Mar 26.57 1 day 1974 Mar 27	Irregular	-	1974 Mar 26.8	51.48	88.19	6566	181	194	0.001	211
D	Cosmos 637 launcher rocket	1974-17C	1974 Mar 26.57 1.90 days 1974 Mar 28.47	Cylinder 4000?	12 long? 4 dia	1974 Mar 27.0	51.52	88.02	6557	166	191	0.002	330
D	Cosmos 637 rocket	1974-17D	1974 Mar 26.57 966 days 1976 Nov 16	Cylinder 1900?	3.9 long? 3.9 dia	1974 Sep 15.1	47.29	630.18	24356	300	35655	0.726	46
D	Fragment	1974-17E											

* 1974-16F ejected from 1974-16A about 1974 Apr 2.

** There may be a separated apogee motor in a similar orbit.

Year of launch 1974 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 638	1974-18A	1974 Apr 3.32	Sphere-cylinder + 2 wings 6680?	7.5 long 2.2 dia	1974 Apr 3.9	51.78	89.41	6626	187	309	0.009	90
R			9.9 days			1974 Apr 7.7	51.78	89.77	6644	258	274	0.001	265
			1974 Apr 13.2										
D	Cosmos 638 rocket	1974-18B	1974 Apr 3.32 6.22 days 1974 Apr 9.54	Cylinder 2500?	7.5 long 2.6 dia	1974 Apr 4.0	51.78	89.36	6624	186	305	0.009	86
D	Fragments	1974-18C-E											
D	Cosmos 639	1974-19A	1974 Apr 4.36	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1974 Apr 4.5	81.31	88.85	6594	206	226	0.001	317
R			10.8 days			1974 Apr 6.8	81.31	88.84	6594	181	250	0.005	25
			1974 Apr 15.2										
D	Cosmos 639 rocket	1974-19B	1974 Apr 4.36 2.96 days 1974 Apr 7.32	Cylinder 2500?	7.5 long 2.6 dia	1974 Apr 5.5	81.31	88.52	6579	188	213	0.002	304
D	Cosmos 639 engine*	1974-19D	1974 Apr 4.36 13 days 1974 Apr 17	Cone 600? Full	1.5 long? 2 dia?	1974 Apr 14.4	81.31	88.34	6570	163	220	0.004	343
D	Fragments	1974-19C,E,F											
D	[Titan 3D]	1974-20A	1974 Apr 10.85 109 days 1974 Jul 28	Cylinder 13300? full	15 long 3.0 dia	1974 Apr 12.2	94.52	88.91	6597	153	285	0.010	143
T	Capsule	1974-20B	1974 Apr 10.85 90 years	Octagon 60?	0.3 long? 0.9 dia?	1974 Apr 13.9	94.61	101.07	7186	786	830	0.003	127
T	Capsule	1974-20C	1974 Apr 10.85 5.8 years	Octagon 60?	0.3 long? 0.9 dia?	1974 Apr 12.6	94.00	95.01	6895	503	531	0.002	79
D	Titan 3D rocket	1974-20D	1974 Apr 10.85 1.79 days 1974 Apr 12.64	Cylinder 1900	6 long 3.0 dia	1974 Apr 11.7	94.50	88.43	6573	148	242	0.007	143

* 1974-19D ejected from 1974-19A on 1974 Apr 14

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 640	1974-21A	1974 Apr 11.52 11.83 days 1974 Apr 23.35	Sphere-cylinder 5700?	5.0 long 2.4 dia	1974 Apr 12.4	81.32	88.78	6591	201	225	0.002	307
D	Cosmos 640 rocket	1974-21B	1974 Apr 11.52 3.12 days 1974 Apr 14.64	Cylinder 2500?	7.5 long 2.6 dia	1974 Apr 12.7	81.32	88.48	6576	181	215	0.003	300
T	Westar 1	1974-22A	1974 Apr 13.98 >million years	Cylinder 574 full 300 empty	1.65 long 1.90 dia	1974 Sep 1.0	0.0	1435.4	42144	35761	35770	0.0001	-
D	Westar 1 second stage	1974-22B	1974 Apr 13.98 42 days 1974 May 25	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1974 Apr 17.2	28.58	91.19	6719	227	454	0.017	225
D	Westar 1 third stage	1974-22C	1974 Apr 13.98 226 days 1974 Nov 25	Sphere-cone 66	1.32 long 0.94 dia	1974 Apr 14.2	24.75	637.64	24551	202	36143	0.732	178
	Molniya 1AC	1974-23A	1974 Apr 20.87 13 years	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1974 Apr 23.5 1974 Sep 1.0	62.86 63.0	737.63 717.81	27043 26557	624 606	40707 39752	0.741 0.737	288 -
D	Molniya 1AC launcher rocket	1974-23B	1974 Apr 20.87 60.29 days 1974 Jun 20.16	Cylinder 2500?	7.5 long 2.6 dia	1974 Apr 23.0	62.85	92.53	6778	219	580	0.027	120

1974-23 continued on page 363

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Molniya 1AC launcher	1974-23C	1974 Apr 20.87 74.36 days 1974 Jul 4.23	Irregular	-	1974 Apr 23.1	62.82	92.98	6799	217	625	0.030	120
	Molniya 1AC rocket	1974-23E	1974 Apr 20.87 13 years	Cylinder 440	2.0 long 2.0 dia	1974 Apr 23.5	62.88	734.50	26967	624	40553	0.740	288
D	Fragment	1974-23D											
	Cosmos 641	1974-24A	1974 Apr 23.59 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Apr 24.6	74.01	114.60	7815	1389	1484	0.006	112
	Cosmos 642	1974-24B	1974 Apr 23.59 4000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Apr 27.2	74.01	113.83	7780	1321	1483	0.010	99
	Cosmos 643	1974-24C	1974 Apr 23.59 6000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Apr 26.2	74.01	114.22	7798	1355	1484	0.008	106
	Cosmos 644	1974-24D	1974 Apr 23.59 5000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Apr 25.5	74.02	114.02	7788	1336	1484	0.009	107
	Cosmos 645	1974-24E	1974 Apr 23.59 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Apr 28.5	74.02	114.40	7806	1370	1485	0.007	106
	Cosmos 646	1974-24F	1974 Apr 23.59 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Apr 28.5	74.01	114.81	7824	1405	1487	0.005	117
	Cosmos 647	1974-24G	1974 Apr 23.59 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Apr 25.9	74.01	115.00	7833	1424	1486	0.004	123

1974-24 continued on page 364

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 648	1974-24H	1974 Apr 23.59 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Apr 25.9	74.01	115.23	7843	1440	1490	0.003	143
	Cosmos 641 rocket	1974-24J	1974 Apr 23.59 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1974 Apr 25.5	74.02	116.99	7923	1479	1610	0.008	254
	Meteor 17	1974-25A	1974 Apr 24.50 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1974 Apr 25.6	81.23	102.58	7258	865	894	0.002	278
	Meteor 17 rocket	1974-25B	1974 Apr 24.50 400 years	Cylinder 1440	3.8 long 2.6 dia	1974 Apr 26.1	81.24	102.67	7262	841	927	0.006	195
	Molniya 2J	1974-26A	1974 Apr 26.60 100 years?	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia?	1974 Apr 27.7 1974 Sep 1.0	62.89 63.0	737.04 717.73	27029 26555	600 417	40702 39937	0.742 0.744	288 -
D	Molniya 2J launcher	1974-26B	1974 Apr 26.60 24.57 days 1974 May 21.17	Irregular	-	1974 Apr 26.7	62.85	90.96	6701	217	428	0.016	130
D	Molniya 2J launcher rocket	1974-26C	1974 Apr 26.60 21.13 days 1974 May 17.73	Cylinder 2500?	7.5 long 2.6 dia	1974 Apr 27.0	62.85	91.00	6703	203	446	0.018	118
	Molniya 2J rocket	1974-26E	1974 Apr 26.60 100 years?	Cylinder 440	2.0 long 2.0 dia	1974 Jul 18.6	62.91	732.75	26924	314	40778	0.751	279
D	Fragment	1974-26D											

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 649†	1974-27A	1974 Apr 29.56 11.6 days 1974 May 11.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1974 Apr 30.1	62.81	89.28	6618	181	299	0.009	67
D	Cosmos 649 rocket	1974-27B	1974 Apr 29.56 3.96 days 1974 May 3.52	Cylinder 2500?	7.5 long 2.6 dia	1974 Apr 29.8	62.79	89.20	6614	178	294	0.009	64
D	Cosmos 649 engine*	1974-27D	1974 Apr 29.56 16.86 days 1974 May 16.42	Cone 600? Full	1.5 long? 2 dia?	1974 May 10.6	62.79	89.20	6614	177	295	0.009	69
D	Fragments	1974-27C,E-G											
	Cosmos 650	1974-28A	1974 Apr 29.71 6000 years	- 500?	-	1974 May 1.9	74.04	113.49	7764	1369	1402	0.002	242
	Cosmos 650 rocket	1974-28B	1974 Apr 29.71 4000 years	Cylinder 2200?	7.4 long 2.4 dia	1974 May 1.3	74.04	113.33	7756	1364	1392	0.002	219
	Cosmos 651**	1974-29A	1974 May 15.31 600 years	Cone-cylinder	6 long? 2 dia?	1974 May 16.1 1974 Sep 1.0	64.97 64.97	89.64 103.45	6635 7301	250 892	264 954	0.001 0.004	266 -
D	Cosmos 651 rocket	1974-29B	1974 May 15.31 75.92 days 1974 Jul 30.23	Cylinder 1500?	8 long? 2.5 dia?	1974 Jul 26.6	64.95	89.51	6629	243	258	0.001	281
D	Cosmos 651 platform	1974-29C	1974 May 15.31 112.75 days 1974 Sep 5.06	Irregular	-	1974 Jul 27.2	64.95	89.57	6632	245	262	0.001	286

* 1974-27D ejected from 1974-27A about 1974 May 10.

** 1974-29B and 29C attached to 1974-29A until orbit change between 1974 Jul 25.3 and 25.9.

†Manoeuvrable

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 652†	1974-30A	1974 May 15.36 7.9 days 1974 May 23.3	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1974 May 16.2	51.76	89.61	6636	173	343	0.013	80
D	Cosmos 652 rocket	1974-30B	1974 May 15.36 4.15 days 1974 May 19.51	Cylinder 2500?	7.5 long 2.6 dia	1974 May 16.2	51.76	89.38	6625	169	324	0.012	78
D	Cosmos 652 engine*	1974-30E	1974 May 15.36 21 days 1974 Jun 5	Cone 600? Full	1.5 long? 2 dia?	1974 May 24.0	51.78	90.83	6696	218	417	0.015	50
D	Fragments	1974-30C,D,F,G											
D R	Cosmos 653	1974-31A	1974 May 15.52 11.65 days 1974 May 27.17	Sphere-cylinder 5700?	5.0 long 2.4 dia	1974 May 16.4	62.81	89.27	6618	192	287	0.007	47
D	Cosmos 653 rocket	1974-31B	1974 May 15.52 4.79 days 1974 May 20.31	Cylinder 2500?	7.5 long 2.6 dia	1974 May 16.7	62.80	89.04	6606	183	273	0.007	41
D	Fragment	1974-31C											
	Cosmos 654**	1974-32A	1974 May 17.29 600 years	Cone-cylinder	6 long? 2 dia?	1974 May 18.2 1974 Sep 1.0	64.99 64.99	89.63 104.44	6635 7347	248 913	265 1024	0.001 0.008	255 -
D	Cosmos 654 rocket	1974-32B	1974 May 17.29 79 days 1974 Aug 4	Cylinder 1500?	8 long? 2.5 dia?	1974 Jul 30.7	64.99	89.59	6633	248	261	0.001	272
D	Cosmos 654 platform	1974-32D	1974 May 17.29 113 days 1974 Sep 7	Irregular	-	1974 Sep 1.0	64.99	88.78	6593	203	226	0.002	-
D	Fragments	1974-32C,E											

* 1974-30E ejected from 1974-30A about 1974 May 22.

† Manoeuvrable

** 1974-32B and 32D attached to 1974-32A until orbit change on 1974 Jul 30.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	SMS 1*	1974-33A	1974 May 17.40 >million years	Cylinder + boom 627 full 243 empty	2.30 long 1.90 dia	1974 May 17.4 1974 May 23.3 1974 Sep 1.0	24.47 1.87 1.90	576.4 1340.4 1436.0	22944 40271 42164	182 32345 35741	32950 35440 35830	0.714 0.038 0.001	182 178 -
D	SMS 1 second stage	1974-33B	1974 May 17.40 3.03 days 1974 May 20.43	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1974 May 19.9	28.32	88.02	6562	155	213	0.004	181
D	SMS 1 third stage	1974-33D	1974 May 17.40 179 days 1974 Nov 12	Sphere-cone 66	1.32 long 0.94 dia	1974 May 17.4	24.52	576.4	22944	182	32950	0.714	182
D	Fragments	1974-33C,E											
D	Intercosmos 11	1974-34A	1974 May 17.45 1938 days 1979 Sep 6	Octagonal ellipsoid 550?	1.8 long? 1.5 dia?	1974 May 19.5	50.64	94.50	6875	483	511	0.002	43
	Intercosmos 11 rocket	1974-34B	1974 May 17.45 5.64 years	Cylinder 2200?	7.4 long 2.4 dia	1974 May 19.5	50.64	94.37	6870	472	511	0.003	46
D	Fragment	1974-34C											
	Cosmos 655	1974-35A	1974 May 21.26 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1974 May 22.5	74.06	95.30	6911	523	542	0.001	16
	Cosmos 655 rocket	1974-35B	1974 May 21.26 10 years	Cylinder 2200?	7.4 long 2.4 dia	1974 May 22.9	74.05	95.21	6906	514	542	0.002	10
4d	Fragments	1974-35C-H											
D R	Cosmos 656	1974-36A	1974 May 27.31 2.0 days 1974 May 29.3	Sphere-cylinder 6570?	7.5 long 2.2 dia	1974 May 28.4	51.60	90.04	6658	195	364	0.013	71
D	Cosmos 656 rocket	1974-36B	1974 May 27.31 6.67 days 1974 Jun 2.98	Cylinder 2500?	7.5 long 2.6 dia	1974 May 29.9	51.57	89.17	6615	179	294	0.009	83

* *Synchronous Meteorological Satellite. An apogee motor may have separated into a similar orbit.*

Year of launch 1974 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Luna 22 launcher rocket	1974-37B	1974 May 29.37 3.86 days 1974 Jun 2.23	Cylinder 4000?	12 long? 4 dia	1974 May 30.7	51.54	88.56	6585	187	226	0.003	4
D	Luna 22 launcher	1974-37C	1974 May 29.37 4 days 1974 Jun 2	-	-	1974 May 31.1	51.56	88.48	6581	178	227	0.004	2
D	Fragment	1974-37D											
D	Cosmos 657	1974-38A	1974 May 30.53 13.64 days 1974 Jun 13.17	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1974 May 31.6 1974 Jun 1.4	62.79 62.79	89.21 89.35	6615 6622	177 177	296 310	0.009 0.010	59 57
R													
D	Cosmos 657 rocket	1974-38B	1974 May 30.53 3 days 1974 Jun 2	Cylinder 2500?	7.5 long 2.6 dia	1974 May 31.4	62.78	88.96	6602	171	277	0.008	53
D	Cosmos 657 engine*	1974-38D	1974 May 30.53 18.58 days 1974 Jun 18.11	Cone 600? Full	1.5 long? 2 dia?	1974 Jun 12.9	62.79	89.05	6607	168	289	0.009	58
D	Fragments	1974-38C,E											
T	ATS 6 [Titan 3C]	1974-39A	1974 May 30.54 >million years	Box + dish + 2 paddles 1402**	4.0 high 9.15 dia 15.8 span	1974 Sep 1.0	1.6	1436.1	42164	35781	35791	0.0001	-
D	ATS 6 second stage	1974-39B	1974 May 30.54 5.31 days 1974 Jun 4.85	Cylinder 1900	6 long 3.0 dia	1974 May 30.5	28.60	91.80	6747	163	575	0.031	-
	ATS 6 rocket	1974-39C	1974 May 30.54 >million years	Cylinder 1500?	6 long? 3.0 dia	1974 Jul 1.0	1.8	1430.4	42053	35553	35797	0.003	-

Space Vehicle: Luna 22, 1974-37A

* 1974-38D ejected from 1974-38A on 1974 Jun 12.

** Payload weight 930kg.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Explorer 52 (Hawkeye*)	1974-40A	1974 Jun 3.97 1427 days 1978 Apr 30	Cone-cylinder 27	0.75 long 0.25 to 0.75 dia	1974 Jun 7.0	89.80	3077.9	70082	513	126896	0.902	275
D	Explorer 52 rocket	1974-40B	1974 Jun 3.97 1226 days 1977 Oct 11	Cylinder 24	1.50 long 0.46 dia	1974 Jun 4.1 1975 Mar 1.0	89.70 89.70	96.00 95.19	6944 6905	337 330	794 723	0.033 0.028	210 -
D	Fragments	1974-40C,D											
D R	Cosmos 658	1974-41A	1974 Jun 6.27 11.85 days 1974 Jun 18.12	Sphere-cylinder 5700?	5.0 long 2.4 dia	1974 Jun 6.4	64.97	89.39	6623	204	286	0.006	37
D	Cosmos 658 rocket	1974-41B	1974 Jun 6.27 6.18 days 1974 Jun 12.45	Cylinder 2500?	7.5 long 2.6 dia	1974 Jun 6.3	64.97	89.29	6618	203	277	0.006	33
D	[Titan 3B Agena D]	1974-42A	1974 Jun 6.69 47 days 1974 Jul 23	Cylinder 3000?	8 long? 1.5 dia	1974 Jun 7.4	110.49	89.81	6643	136	394	0.019	153
D R	Cosmos 659 †	1974-43A	1974 Jun 13.52 12.66 days 1974 Jun 26.18	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1974 Jun 15.4	62.81	89.30	6619	153	329	0.013	61
D	Cosmos 659 rocket	1974-43B	1974 Jun 13.52 5.20 days 1974 Jun 18.72	Cylinder 2500?	7.5 long 2.6 dia	1974 Jun 15.2	62.80	89.28	6618	173	307	0.010	65
D	Cosmos 659 engine**	1974-43D	1974 Jun 13.52 13.65 days 1974 Jun 27.17	Cone 600? full	1.5 long? 2 dia?	1974 Jun 25.5	62.81	89.10	6609	148	314	0.013	61
D	Fragment	1974-43C											

* A separated 5th-stage rocket may be in a similar orbit to Hawkeye.

** 1974-43D ejected from 1974-43A on 1974 Jun 25.

† Manoeuvrable

Year of launch 1974 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 660	1974-44A	1974 Jun 18.54 35 years	-	-	1974 Jun 18.9	82.98	109.11	7563	397	1972	0.104	129
	Cosmos 660 rocket	1974-44B	1974 Jun 18.54 30 years	Cylinder 2200?	7.4 long 2.4 dia	1974 Jun 22.2	82.98	108.97	7556	395	1961	0.104	120
	Cosmos 661	1974-45A	1974 Jun 21.38 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1974 Jun 22.2	74.04	95.24	6908	511	548	0.003	344
	Cosmos 661 rocket	1974-45B	1974 Jun 21.38 10 years	Cylinder 2200?	7.4 long 2.4 dia	1974 Jun 23.2	74.04	95.04	6898	498	541	0.003	1
D	Fragment	1974-45C											
D r	Salyut 3*	1974-46A	1974 Jun 24.95 214 days 1975 Jan 24	Cylinder + 3 wings 18500	14 long 4.15 to 2.0 dia	1974 Jun 25.7 1974 Jun 28.9 1974 Oct 26.4	51.58 51.58 51.57	89.10 89.80 89.93	6611 6646 6652	213 266 256	253 269 292	0.003 0.0002 0.003	81 91 295
D	Salyut 3 rocket	1974-46B	1974 Jun 24.95 8.68 days 1974 Jul 3.63	Cylinder 4000?	12 long? 4 dia	1974 Jun 26.5	51.60	88.86	6599	209	233	0.002	80
D	Fragments	1974-46C,D											
D	Cosmos 662	1974-47A	1974 Jun 26.52 794 days 1976 Aug 28	Ellipsoid 400?	1.8 long 1.2 dia	1974 Jun 29.2 1975 Jul 1.0	70.92 70.90	95.49 93.68	6920 6832	271 262	812 646	0.039 0.028	79 -
D	Cosmos 662 rocket	1974-47B	1974 Jun 26.52 487 days 1975 Oct 26	Cylinder 1500?	8 long 1.65 dia.	1974 Jun 29.2 1975 Jan 30.5	70.92 70.90	95.41 93.62	6916 6829	276 267	799 635	0.038 0.027	80 -

* Salyut 3 was de-orbited over the Pacific Ocean. Capsule ejected and recovered on 1974 Sep 23.4.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 663	1974-48A	1974 Jun 27.65 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1974 Jun 30.9	82.95	104.88	7368	972	1007	0.002	279
	Cosmos 663 rocket	1974-48B	1974 Jun 27.65 600 years	Cylinder 2200?	7.4 long 2.4 dia	1974 Jun 30.8	82.94	104.73	7360	972	992	0.001	271
D R	Cosmos 664	1974-49A	1974 Jun 29.54 11.80 days 1974 Jul 11.34	Sphere-cylinder 5900?	5.9 long 2.4 dia	1974 Jun 30.7	72.85	89.98	6651	205	341	0.010	61
D	Cosmos 664 rocket	1974-49B	1974 Jun 29.54 10.37 days 1974 Jul 9.91	Cylinder 2500?	7.5 long 2.6 dia	1974 Jul 1.9	72.85	89.71	6638	191	328	0.010	47
D	Capsule*	1974-49H	1974 Jun 29.54 14 days 1974 Jul 13	Ellipsoid 200?	0.9 long 1.9 dia	1974 Jul 12.4	72.85	89.20	6612	190	277	0.007	30
D	Fragments	1974-49C-G											
	Cosmos 665	1974-50A	1974 Jun 29.67 15¾ years	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia?	1974 Jun 30.2 1974 Sep 1.0	62.82 62.82	710.65 717.91	26380 26560	625 703	39378 39660	0.734 0.733	318 -
D	Cosmos 665 launcher	1974-50B	1974 Jun 29.67 63.73 days 1974 Sep 1.40	Irregular	-	1974 Jul 1.4	62.82	92.82	6791	216	610	0.029	120
D	Cosmos 665 launcher rocket	1974-50D	1974 Jun 29.67 44.60 days 1974 Aug 13.27	Cylinder 2500?	7.5 long 2.6 dia	1974 Jul 3.6	62.84	92.69	6785	196	618	0.031	118
	Cosmos 665 rocket	1974-50C	1974 Jun 29.67 15¾ years	Cylinder 440	2.0 long 2.0 dia	1974 Jun 30.2	62.82	707.45	26301	605	39241	0.734	318

* 1974-49H ejected from 1974-49A about 1974 Jul 10.

Year of launch 1974 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D 2M R	Soyuz 14*	1974-51A	1974 Jul 3.79 15.72 days 1974 Jul 19.51	Sphere-cylinder 6570?	7.5 long 2.2 dia	1974 Jul 4.0 1974 Jul 5.1	51.58 51.58	88.55 89.84	6584 6648	195 268	217 271	0.002 0.0003	90 259
D	Soyuz 14 rocket	1974-51B	1974 Jul 3.79 2 days 1974 Jul 5	Cylinder 2500?	7.5 long 2.6 dia	1974 Jul 4.5	51.61	88.35	6574	182	210	0.002	69
D	Fragment	1974-51C											
	Meteor 18**	1974-52A	1974 Jul 9.61 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1974 Jul 11.0 1974 Nov 1.0 1975 Nov 1.0	81.23 81.21 81.19	102.57 102.86 103.09	7257 7271 7282	865 879 890	893 906 918	0.002 0.002 0.002	256 - -
	Meteor 18 rocket	1974-52B	1974 Jul 9.61 400 years	Cylinder 1440	3.8 long 2.6 dia	1974 Jul 11.2	81.23	102.72	7264	853	919	0.005	178
D R	Cosmos 666***	1974-53A	1974 Jul 12.54 12.7 days 1974 Jul 25.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1974 Jul 13.0	62.81	89.59	6633	181	328	0.011	73
D	Cosmos 666 rocket	1974-53B	1974 Jul 12.54 5.93 days 1974 Jul 18.47	Cylinder 2500?	7.5 long 2.6 dia	1974 Jul 15.2	62.79	89.07	6608	170	289	0.009	65
D	Cosmos 666 engine	1974-53D	1974 Jul 12.54 17.69 days 1974 Jul 30.23	Cone 600? Full	1.5 long? 2 dia?	1974 Jul 24.6	62.82	89.25	6616	168	308	0.011	66
D	Fragment	1974-53C											
T L	NTS 1† (Timation 3)	1974-54A	1974 Jul 14.22 300 000 years	Octagon + 4 vanes 293 empty	0.56 long 1.22 dia	1974 Jul 22.0	125.08	468.40	19984	13445	13767	0.008	70

* Soyuz 14 docked with Salyut 3 about 1974 Jul 4.88; undocked 1974 Jul 19.38.

** Meteor 18 carried orbital adjustment motor.

† Navigation Technology Satellite.

*** Manoeuvrable.

1974-54 continued on page 373

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	NTS 1 rocket	1974-54B	1974 Jul 14.22 6 years	Cone-cylinder 163	1.85 long 0.63 to 1.65 dia	1974 Jul 15.7	125.12	253.67	13277	193	13604	0.505	150
	NTS 1 apogee motor	1974-54C	1974 Jul 14.22 200000 years	Cylinder	0.88 long? 0.63 dia	1976 Mar 31.0	124.9	468.7	19988	13476	13744	0.007	-
D	Aeros 2*	1974-55A	1974 Jul 16.49 436 days 1975 Sep 25	Cylinder 127 Payload 28	0.74 long 0.91 dia	1974 Jul 17.6 1975 Feb 25.5	97.45 97.37	95.60 91.43	6925 6721	224 278	869 407	0.047 0.010	160 70
D	Aeros 2 rocket	1974-55B	1974 Jul 16.49 85.04 days 1974 Oct 9.53	Cylinder 24	1.50 long 0.46 dia	1974 Jul 18.5	97.44	95.59	6924	220	872	0.047	158
D	Fragment	1974-55C											
	Molniya 2K	1974-56A	1974 Jul 23.06 19 years	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia	1974 Jul 24.1 1974 Jul 27.7	62.89 62.90	737.59 718.17	27043 26566	604 505	40726 39871	0.742 0.741	288 281
D	Molniya 2K launcher rocket	1974-56B	1974 Jul 23.06 34.02 days 1974 Aug 26.08	Cylinder 2500?	7.5 long 2.6 dia	1974 Jul 23.8	62.84	91.10	6707	217	441	0.017	130
D	Molniya 2K launcher	1974-56C	1974 Jul 23.06 36.80 days 1974 Aug 28.86	Irregular	-	1974 Jul 23.8	62.81	91.19	6712	216	451	0.018	130
	Molniya 2K rocket	1974-56D	1974 Jul 23.06 19 years	Cylinder 440	2.0 long 2.0 dia	1974 Jul 30.2	62.94	734.10	26957	456	40702	0.746	280

* FRG satellite.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 667 †	1974-57A	1974 Jul 25.29 12.9 days 1974 Aug 7.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1974 Jul 26.3	64.98	89.46	6626	176	320	0.011	61
D	Cosmos 667 rocket	1974-57B	1974 Jul 25.29 4.78 days 1974 Jul 30.07	Cylinder 2500?	7.5 long 2.6 dia	1974 Jul 26.3	64.97	89.19	6613	176	294	0.009	55
D	Cosmos 667 engine*	1974-57D	1974 Jul 25.29 24 days 1974 Aug 18	Cone 600? Full	1.5 long? 2 dia?	1974 Aug 16.0	64.97	88.69	6588	165	255	0.007	-
D	Fragment	1974-57C											
D	Cosmos 668	1974-58A	1974 Jul 25.50 210.78 days 1975 Feb 21.28	Ellipsoid 400?	1.8 long 1.2 dia	1974 Jul 26.4	70.95	92.20	6760	270	494	0.017	83
D	Cosmos 668 rocket	1974-58B	1974 Jul 25.50 112.57 days 1974 Nov 15.07	Cylinder 1500?	8 long 1.65 dia	1974 Jul 26.4	70.95	92.01	6751	273	472	0.015	83
D R	Cosmos 669	1974-59A	1974 Jul 26.29 12.83 days 1974 Aug 8.12	Sphere-cylinder 5900?	5.9 long 2.4 dia	1974 Jul 27.1	81.32	88.91	6598	209	230	0.002	339
D	Cosmos 669 rocket	1974-59B	1974 Jul 26.29 3.83 days 1974 Jul 30.12	Cylinder 2500?	7.5 long 2.6 dia	1974 Jul 27.4	81.33	88.67	6586	198	217	0.001	322
D	Capsule**	1974-59G	1974 Jul 26.29 16.18 days 1974 Aug 11.47	Ellipsoid 200?	0.9 long 1.9 dia	1974 Aug 6.2	81.33	88.78	6591	201	225	0.002	283
D	Fragments	1974-59C-F											

* 1974-57D ejected from 1974-57A on 1974 Aug 6.

** 1974-59G ejected from 1974-59A about 1974 Aug 3.

† Manoeuvrable.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Molniya S1*	1974-60A	1974 Jul 29.50 > million years	-	-	1974 Jul 29.5 1974 Sep 1.0	47.49 0.07	632.35 1436.2	24410 42167	340 35787	35724 35790	0.725 0.0	0 -
D	Molniya S1 launcher	1974-60B	1974 Jul 29.50 2.64 days 1974 Aug 1.14	Irregular	-	1974 Jul 29.9	51.49	88.21	6567	183	195	0.001	307
D	Molniya S1 launcher rocket	1974-60C	1974 Jul 29.50 2 days 1974 Jul 31	Cylinder 4000?	12 long? 4 dia	1974 Jul 29.9	51.47	88.28	6571	186	199	0.001	307
D	Molniya S1 rocket	1974-60D	1974 Jul 29.50 1642 days 1979 Jan 26	Cylinder 1900?	3.9 long? 3.9 dia	1974 Jul 30.9	47.49	634.14	24455	355	35799	0.725	1
D	Fragment	1974-60E											
D R	Cosmos 670	1974-61A	1974 Aug 6.01 3.0 days 1974 Aug 9.0	Sphere-cylinder 6570?	7.5 long 2.2 dia	1974 Aug 6.4	50.55	89.48	6631	211	294	0.006	95
D	Cosmos 670 rocket	1974-61B	1974 Aug 6.01 7.38 days 1974 Aug 13.39	Cylinder 2500?	7.5 long 2.6 dia	1974 Aug 6.3	50.56	89.30	6622	208	279	0.005	92
D R	Cosmos 671	1974-62A	1974 Aug 7.54 12.7 days 1974 Aug 20.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1974 Aug 8.1 1974 Aug 9.1	62.82 62.82	89.84 89.30	6646 6619	182 169	353 312	0.013 0.011	75 60
D	Cosmos 671 rocket	1974-62B	1974 Aug 7.54 6.88 days 1974 Aug 14.42	Cylinder 2500?	7.5 long 2.6 dia	1974 Aug 8.1	62.80	89.68	6638	180	339	0.012	74

* First geostationary Molniya satellite. An apogee rocket may have separated from 1974-60A in equatorial orbit.

1974-62 continued on page 376

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 671 engine*	1974-62C	1974 Aug 7.54 33 days 1974 Sep 9	Cone 600? Full	1.5 long? 2 dia?	1974 Aug 19.4	62.81	89.14	6611	163	302	0.011	57
D	Fragment	1974-62D											
T	[Thor Burner 2]	1974-63A	1974 Aug 9.14 80 years	12-sided frustum 195	1.64 long 1.31 to 1.10 dia	1974 Aug 10.0	98.86	101.76	7219	806	875	0.005	233
	Burner 2 rocket	1974-63B	1974 Aug 9.14 60 years	Sphere-cone 66	1.32 long 0.94 dia	1974 Aug 9.4	98.87	101.71	7217	805	872	0.005	243
D	Cosmos 672	1974-64A	1974 Aug 12.27 5.9 days 1974 Aug 18.2	Sphere-cylinder + 2 wings 6680?	7.5 long 2.2 dia	1974 Aug 12.5 1974 Aug 14.5	51.76 51.76	88.59 89.09	6586 6611	195 227	221 238	0.002 0.001	76 61
R													
D	Cosmos 672 rocket	1974-64B	1974 Aug 12.27 2.34 days 1974 Aug 14.61	Cylinder 2500?	7.5 long 2.6 dia	1974 Aug 12.6	51.76	88.52	6582	194	214	0.002	68
D	Fragment	1974-64C											
D	[Titan 3B Agena D]	1974-65A	1974 Aug 14.66 46 days 1974 Sep 29	Cylinder 3000?	8 long? 1.5 dia	1974 Aug 16.4	110.51	89.89	6647	135	402	0.020	150
	Cosmos 673	1974-66A	1974 Aug 16.16 60 years	Cylinder + 2 vanes? 2500?	5 long? 1.5 dia?	1974 Aug 18.6	81.21	97.17	7000	607	637	0.002	271
	Cosmos 673 rocket	1974-66B	1974 Aug 16.16 60 years	Cylinder 1440	3.8 long 2.6 dia	1974 Aug 18.2	81.22	97.29	7006	578	678	0.007	187
	Fragment	1974-66C											

* 1974-62C ejected from 1974-62A on 1974 Aug 19.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Soyuz 15*	1974-67A	1974 Aug 26.83	Sphere-cylinder	7.5 long	1974 Aug 27.1	51.62	88.52	6583	173	236	0.005	26
2M			2.01 days	2.2 dia		1974 Aug 27.5	51.60	89.67	6639	251	271	0.002	336
R			1974 Aug 28.84	6570?									
D	Soyuz 15 rocket	1974-67B	1974 Aug 26.83	Cylinder	7.5 long	1974 Aug 27.1	51.60	88.43	6578	189	211	0.002	53
			2.00 days	2500?	2.6 dia								
			1974 Aug 28.83										
D	Cosmos 674**	1974-68A	1974 Aug 29.32	Sphere-cylinder	6.5 long?	1974 Aug 30.0	64.99	89.48	6627	175	323	0.011	56
R			8.9 days	6300?	2.4 dia								
			1974 Sep 7.2										
D	Cosmos 674 rocket	1974-68B	1974 Aug 29.32	Cylinder	7.5 long	1974 Aug 29.6	65.00	89.40	6623	174	316	0.011	54
			5.78 days	2500?	2.6 dia								
			1974 Sep 4.10										
D	Cosmos 674 engine***	1974-68C	1974 Aug 29.32	Cone	1.5 long?	1974 Sep 6.4	64.99	89.31	6619	174	307	0.010	53
			16 days	600?	2 dia?								
			1974 Sep 14	Full									
D	Fragment	1974-68D											
	Cosmos 675	1974-69A	1974 Aug 29.62	-	-	1974 Aug 30.6	74.04	113.70	7774	1365	1426	0.004	203
			5000 years	500?									
	Cosmos 675 rocket	1974-69B	1974 Aug 29.62	Cylinder	7.4 long	1974 Sep 1.2	74.05	113.57	7768	1359	1421	0.004	189
			4000 years	2200?	2.4 dia								
D	ANS 1†	1974-70A	1974 Aug 30.59	Box +	1.23 long	1974 Aug 30.8	98.03	99.13	7094	258	1173	0.064	211
			1019 days	2 panels	0.61 wide								
			1977 Jun 14	129	0.73 deep								
D	ANS 1 rocket	1974-70B	1974 Aug 30.59	Cylinder	1.50 long	1974 Aug 31.7	98.04	99.12	7093	259	1171	0.064	208
			446 days	24	0.46 dia	1975 Mar 31.5	98.04	95.92	6939	251	871	0.045	-
			1975 Nov 19										
D	Fragments	1974-70C-E											

* Soyuz 15 passed near to Salyut 3 about 1974 Aug 27.8. *** 1974-68C ejected from 1974-68A on 1974 Sep 6. †Astronomical Netherlands Satellite.

** Manoeuvrable.

Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
Cosmos 676	1974-71A	1974 Sep 11.74 120 years	Cylinder + paddles 750?	2 long? 1 dia?	1974 Sep 12.7	74.05	101.01	7184	796	816	0.001	58
Cosmos 676 rocket	1974-71B	1974 Sep 11.74 100 years	Cylinder 2200?	7.4 long 2.4 dia	1974 Sep 12.8	74.05	100.91	7180	787	816	0.002	54
Cosmos 677	1974-72A	1974 Sep 19.61 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Sep 21.0	74.03	114.53	7812	1399	1469	0.004	86
Cosmos 678	1974-72B	1974 Sep 19.61 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Sep 24.5	74.03	116.03	7880	1468	1535	0.004	260
Cosmos 679	1974-72C	1974 Sep 19.61 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Sep 24.8	74.02	115.78	7869	1468	1513	0.003	265
Cosmos 680	1974-72D	1974 Sep 19.61 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Sep 22.4	74.03	115.58	7859	1468	1494	0.002	258
Cosmos 681	1974-72E	1974 Sep 19.61 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Sep 22.4	74.03	115.35	7849	1468	1474	0.0004	298
Cosmos 682	1974-72F	1974 Sep 19.61 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Sep 25.9	74.03	115.15	7840	1455	1468	0.001	86
Cosmos 683	1974-72G	1974 Sep 19.61 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Sep 28.3	74.03	114.95	7831	1436	1469	0.002	83

1974-72 continued on page 379

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 684	1974-72H	1974 Sep 19.61 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1974 Sep 25.6	74.02	114.74	7821	1418	1468	0.003	91
	Cosmos 677 rocket	1974-72J	1974 Sep 19.61 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1974 Sep 21.0	74.02	117.82	7961	1471	1694	0.014	271
D R	Cosmos 685	1974-73A	1974 Sep 20.40 11.85 days 1974 Oct 2.25	Sphere-cylinder 5700?	5.0 long 2.4 dia	1974 Sep 21.3	64.98	89.39	6623	205	285	0.006	46
D	Cosmos 685 rocket	1974-73B	1974 Sep 20.40 6 days 1974 Sep 26	Cylinder 2500?	7.5 long 2.6 dia	1974 Sep 21.8	64.99	89.13	6610	198	266	0.005	31
D	Fragment	1974-73C											
D	Cosmos 686	1974-74A	1974 Sep 26.69 216.53 days 1975 May 1.22	Ellipsoid 400?	1.8 long 1.2 dia	1974 Sep 27.8	71.00	92.18	6759	273	489	0.016	74
D	Cosmos 686* rocket	1974-74B	1974 Sep 26.69 33.11 days 1974 Oct 29.80	Cylinder 1500?	8 long 1.65 dia	1974 Sep 27.3	70.93	91.69	6735	260	454	0.014	67
D	Fragments	1974-74C-V											
T	Westar 2	1974-75A	1974 Oct 10.95 > million years	Cylinder 574 full 300 empty	1.65 long 1.90 dia	1974 Nov 1.0 1975 Jan 1.0	0.4 0.0	1432.7 1435.9	42100 42166	35710 35780	35734 35795	0.0003 0.0002	- -
D	Westar 2 second stage	1974-75B	1974 Oct 10.95 1535 days 1978 Dec 23	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1974 Oct 13.2	27.33	123.46	8220	230	3454	0.196	194

1974-75 continued on page 380

* Rocket disintegrated. The main piece may not be 1974-74B

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Westar 2 third stage	1974-75C	1974 Oct 10.95 10 years	Sphere-cone 66	1.32 long 0.94 dia	1974 Oct 13.9	24.81	641.42	24648	227	36313	0.732	180
D	Cosmos 687	1974-76A	1974 Oct 11.48 1213 days 1978 Feb 5	Octagonal ellipsoid 550?	1.8 long? 1.5 dia?	1974 Oct 12.1	74.00	94.48	6870	286	698	0.030	133
D	Cosmos 687 rocket	1974-76B	1974 Oct 11.48 816 days 1977 Jan 4	Cylinder 2200?	7.4 long 2.4 dia	1974 Oct 12.3	73.99	94.40	6866	285	691	0.030	131
T	Ariel 5	1974-77A	1974 Oct 15.32 5.4 years	Cylinder 129	0.86 long 0.95 dia	1974 Oct 16.5	2.88	94.96	6905	504	549	0.003	268
D	Ariel 5 rocket	1974-77B	1974 Oct 15.32 1671 days 1979 May 13	Cylinder 24	1.50 long 0.46 dia	1974 Oct 21.9	2.88	94.97	6905	504	550	0.003	351
D R	Cosmos 688†	1974-78A	1974 Oct 18.63 11.66 days 1974 Oct 30.29	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1974 Oct 19.4	62.82	89.77	6642	179	349	0.013	74
D	Cosmos 688 rocket	1974-78B	1974 Oct 18.63 5.88 days 1974 Oct 24.51	Cylinder 2500?	7.5 long 2.6 dia	1974 Oct 20.9	62.81	89.27	6617	172	306	0.010	69
D	Cosmos 688 engine*	1974-78D	1974 Oct 18.63 12.58 days 1974 Oct 31.21	Cone 600? Full	1.5 long? 2 dia?	1974 Oct 29.7	62.81	88.88	6598	145	294	0.011	59
D	Fragment	1974-78C											

* 1974-78D ejected from 1974-78A on 1974 Oct 29.

† Manoeuvrable.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 689	1974-79A	1974 Oct 18.94 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1974 Oct 19.4	82.94	105.12	7377	981	1017	0.002	255
	Cosmos 689 rocket	1974-79B	1974 Oct 18.94 600 years	Cylinder 2200?	7.4 long 2.4 dia	1974 Oct 19.4	82.94	105.00	7371	977	1009	0.002	242
D B R	Cosmos 690	1974-80A	1974 Oct 22.75 20.5 days 1974 Nov 12.2	Sphere-cylinder 5900?	5.9 long 2.4 dia	1974 Oct 27.6	62.81	90.29	6668	215	354	0.011	114
D	Cosmos 690 rocket	1974-80B	1974 Oct 22.75 18.04 days 1974 Nov 10.39	Cylinder 2500?	7.5 long 2.6 dia	1974 Oct 26.9	62.80	90.08	6658	214	345	0.010	110
D	Capsule	1974-80E	1974 Oct 22.75 53 days 1974 Dec 14	Ellipsoid 200?	0.9 long 1.9 dia	1974 Nov 12.5	62.80	90.02	6655	212	341	0.010	-
D	Fragments	1974-80C,D,F-H											
	Molniya 1AD	1974-81A	1974 Oct 24.53 14½ years*	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1974 Oct 25.6 1974 Oct 29.7	62.82 62.84	736.37 717.87	27013 26559	656 646	40614 39715	0.740 0.735	288 288
D	Molniya 1AD launcher rocket	1974-81B	1974 Oct 24.53 68.20 days 1974 Dec 31.73	Cylinder 2500?	7.5 long 2.6 dia	1974 Oct 26.6	62.84	92.95	6798	217	623	0.030	120
D	Molniya 1AD launcher	1974-81C	1974 Oct 24.53 70.97 days 1975 Jan 3.50	Irregular	-	1974 Oct 26.6	62.82	93.25	6813	211	658	0.033	119
	Molniya 1AD rocket	1974-81D	1974 Oct 24.53 14½ years*	Cylinder 440	2.0 long 2.0 dia	1974 Oct 25.6	62.81	731.93	26904	642	40410	0.739	288
D	Fragment	1974-81E											

* Possibility of decay in mid 1986 when perigee falls to 150km.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 691†	1974-82A	1974 Oct 25.40 11.86 days 1974 Nov 6.26	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1974 Oct 27.1	65.04	89.50	6629	173	328	0.012	66
D	Cosmos 691 rocket	1974-82B	1974 Oct 25.40 4.14 days 1974 Oct 29.54	Cylinder 2500?	7.5 long 2.6 dia	1974 Oct 27.0	65.04	89.05	6606	169	287	0.009	63
D	Cosmos 691 engine*	1974-82C	1974 Oct 25.40 16 days 1974 Nov 10	Cone 600? Full	1.5 long? 2 dia?	1974 Nov 4.6	65.03	89.23	6615	167	307	0.011	62
D	Fragment	1974-82D											
	Meteor 19	1974-83A	1974 Oct 28.43 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1974 Oct 28.8	81.18	102.48	7253	843	907	0.004	302
	Meteor 19 rocket	1974-83B	1974 Oct 28.43 400 years	Cylinder 1440	3.8 long 2.6 dia	1974 Oct 28.7	81.18	102.62	7260	852	911	0.004	244
D	Luna 23 launcher	1974-84B	1974 Oct 28.60 3.43 days 1974 Nov 1.03	-	-	1974 Oct 29.1	51.54	88.72	6593	183	246	0.005	307
D	Luna 23 launcher rocket	1974-84C	1974 Oct 28.60 3.43 days 1974 Nov 1.03	Cylinder 4000?	12 long? 4 dia	1974 Oct 29.4	51.53	88.62	6588	179	240	0.005	316

* 1974-82C ejected from 1974-82A on 1974 Nov 4

† Manoeuvrable.

Space Vehicle: Luna 23, 1974-84A

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Titan 3D]	1974-85A	1974 Oct 29.81 141 days 1975 Mar 19	Cylinder 13300? full	15 long 3.0 dia	1974 Oct 30.0	96.69	88.86	6595	162	271	0.008	164
D	Titan 3D rocket	1974-85D	1974 Oct 29.81 2.02 days 1974 Oct 31.83	Cylinder 1900	6 long 3.0 dia	1974 Oct 30.2	96.69	88.73	6588	157	263	0.008	174
T	Capsule	1974-85B	1974 Oct 29.81 5¼ years	Octagon 60?	0.3 long? 0.9 dia?	1974 Nov 3.2	96.06	95.22	6906	520	535	0.001	160
D	SESP 73-5*	1974-85C	1974 Oct 29.81 208.70 days 1975 May 26.51	-	-	1974 Oct 31.9	96.98	126.59	8352	152	3795	0.218	133
D	Intercosmos 12	1974-86A	1974 Oct 31.42 253 days 1975 Jul 11	Octagonal ellipsoid 550?	1.8 long? 1.5 dia?	1974 Nov 2.4	74.02	94.11	6853	243	707	0.034	37
D	Intercosmos 12 rocket	1974-86B	1974 Oct 31.42 265 days 1975 Jul 23	Cylinder 2200?	7.4 long 2.4 dia	1974 Nov 3.2	74.00	94.01	6848	240	700	0.034	34
D	Fragments	1974-86C,D											
D R	Cosmos 692	1974-87A	1974 Nov 1.60 11.7 days 1974 Nov 13.3	Sphere-cylinder 5900?	5.9 long 2.4 dia	1974 Nov 1.6	62.82	89.41	6624	197	295	0.007	57
D	Cosmos 692 rocket	1974-87B	1974 Nov 1.60 5 days 1974 Nov 6	Cylinder 2500?	7.5 long 2.6 dia	1974 Nov 3.3	62.79	89.08	6608	184	275	0.007	48

* Space Experiments Support Programme - carried 8 atmospheric-density experiments.

1974-87 continued on page 384

Year of launch 1974 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Capsule*	1974-87F	1974 Nov 1.60 22.32 days 1974 Nov 23.92	Ellipsoid 200?	0.9 long 1.9 dia	1974 Nov 11.6	62.81	89.24	6616	193	282	0.007	58
D	Fragments	1974-87C-E,G											
D R	Cosmos 693	1974-88A	1974 Nov 4.45 11.8 days 1974 Nov 16.3	Sphere-cylinder 5900?	5.9 long 2.4 dia	1974 Nov 5.4	81.33	89.14	6609	219	243	0.002	47
D	Cosmos 693 rocket	1974-88B	1974 Nov 4.45 4.59 days 1974 Nov 9.04	Cylinder 2500?	7.5 long 2.6 dia	1974 Nov 5.4	81.33	88.93	6599	212	229	0.001	23
D	Capsule**	1974-88E	1974 Nov 4.45 13 days 1974 Nov 17	Ellipsoid 200?	0.9 long 1.9 dia	1974 Nov 16.6	81.53	88.49	6577	182	215	0.002	85
D	Fragments	1974-88C,D											
T	NOAA 4 (ITOS)	1974-89A	1974 Nov 15.72 10000 years	Box 340	1.25 long 1.02 sq.	1974 Nov 18.4	101.75	115.00	7833	1447	1462	0.001	256
T	Oscar 7	1974-89B	1974 Nov 15.72 10000 years	8-sided cylinder 29	0.43 long 0.42 dia	1974 Nov 17.3	101.74	114.97	7831	1444	1462	0.001	214
	Intasat 1***	1974-89C	1974 Nov 15.72 10000 years	12-sided cylinder 20	0.45 long 0.44 dia	1974 Nov 18.4	101.73	114.95	7830	1442	1462	0.001	209
	NOAA 4† second stage	1974-89D	1974 Nov 15.72 disintegrated	Cylinder 350?	4.9 long 1.43 dia	1974 Nov 17.4	101.74	114.99	7832	1447	1461	0.001	210
3d	Fragments	1974-89E-EK											

* 1974-87F ejected from 1974-87A about 1974 Nov 11.
** 1974-88E ejected from 1974-88A about 1974 Nov 16.
*** First Spanish satellite.
† Disintegrated about 1975 Aug 20.50

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 694	1974-90A	1974 Nov 16.49	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1974 Nov 17.5	72.83	89.37	6621	173	313	0.011	56
R			12.8 days 1974 Nov 29.3			1974 Nov 22.8	72.83	89.59	6632	172	336	0.012	46
D	Cosmos 694 rocket	1974-90B	1974 Nov 16.49 9.25 days 1974 Nov 25.74	Cylinder 2500?	7.5 long 2.6 dia	1974 Nov 18.5	72.82	89.50	6628	198	301	0.008	58
D	Cosmos 694 engine	1974-90E	1974 Nov 16.49 17 days 1974 Dec 3	Cone 600? Full	1.5 long? 2 dia?	1974 Nov 29.5	72.83	89.36	6621	166	319	0.012	-
D	Fragments	1974-90C,D,F,G											
D	Cosmos 695	1974-91A	1974 Nov 20.50 237 days 1975 Jul 15	Ellipsoid 400?	1.8 long 1.2 dia	1974 Nov 21.3	71.00	91.96	6749	273	468	0.014	82
D	Cosmos 695 rocket	1974-91B	1974 Nov 20.50 114.77 days 1975 Mar 15.27	Cylinder 1500?	8 long 1.65 dia	1974 Nov 23.2	70.99	91.80	6741	272	453	0.013	79
	Molniya 3A	1974-92A	1974 Nov 21.44 11 years	Windmill + 6 vanes 1500?	4.2 long? 1.6 dia	1974 Nov 25.1	62.82	737.26	27035	628	40685	0.741	288
						1974 Nov 26.6	62.82	717.50	26549	503	39839	0.741	288
D	Molniya 3A launcher rocket	1974-92B	1974 Nov 21.44 67.08 days 1975 Jan 27.52	Cylinder 2500?	7.5 long 2.6 dia	1974 Nov 22.5	62.83	92.70	6786	215	600	0.028	121
D	Molniya 3A launcher	1974-92C	1974 Nov 21.44 51.41 days 1975 Jan 11.85	Irregular	-	1974 Nov 22.5	62.84	92.82	6792	201	626	0.031	117
	Molniya 3A rocket	1974-92E	1974 Nov 21.44 11 years	Cylinder 440	2.0 long 2.0 dia	1974 Nov 24.0	62.73	733.95	26954	621	40530	0.740	288
D	Fragment	1974-92D											

Year of launch 1974 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Intelsat 4F (F-8)	1974-93A	1974 Nov 21.99 >million years	Cylinder 1410 full 720 empty	2.82 long 2.39 dia	1974 Dec 31	1.77	1436.2	42167	35775	35801	0.0003	60
	Intelsat 4F rocket	1974-93B	1974 Nov 21.99 6000 years	Cylinder 1815	8.6 long 3.0 dia	1974 Nov 26.3	25.99	653.78	24963	557	36612	0.722	182
T	Skynet 2B	1974-94A	1974 Nov 23.02 >million years	Cylinder 435 full 235 empty	1.33 long 1.90 dia	1974 Dec 3.0 1975 May 1.0	2.30 1.9	1469.5 1436.2	42818 42167	36255 35784	36621 35794	0.0043 0.0001	181 -
D	Skynet 2B second stage	1974-94B	1974 Nov 23.02 45 days 1975 Jan 7	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1974 Nov 24.5	28.17	97.95	7046	183	1152	0.069	187
D	Skynet 2B rocket	1974-94E	1974 Nov 23.02 718 days 1976 Nov 10	Sphere-cone 66	1.32 long 0.94 dia	1974 Nov 24.0	24.49	651.35	24893	176	36854	0.737	179
1d	Fragments	1974-94C,D											
D R	Cosmos 696	1974-95A	1974 Nov 27.49 11.8 days 1974 Dec 9.3	Sphere-cylinder 5700?	5.0 long 2.4 dia	1974 Nov 28.5	72.85	89.77	6641	205	321	0.009	63
D	Cosmos 696 rocket	1974-95B	1974 Nov 27.49 8.02 days 1974 Dec 5.51	Cylinder 2500?	7.5 long 2.6 dia	1974 Nov 28.1	72.86	89.69	6637	198	320	0.009	57
D	Fragments	1974-95C,D											
D 2M R	Soyuz 16	1974-96A	1974 Dec 2.40 5.94 days 1974 Dec 8.34	Sphere-cylinder + 2 wings 6680?	7.5 long 2.2 dia	1974 Dec 2.6 1974 Dec 3.1 1974 Dec 5.3	51.80 51.80 51.80	89.19 88.37 88.95	6616 6575 6604	184 183 225	291 210 226	0.008 0.002 0	91 94 -*

* Approximate orbit.

1974-96 continued on page 387

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Soyuz 16 rocket	1974-96B	1974 Dec 2.40 5.12 days 1974 Dec 7.52	Cylinder 2500?	7.5 long 2.6 dia	1974 Dec 3.2	51.80	89.11	6612	184	283	0.007	91
D	Fragments	1974-96C-F											
D	Helios 1 second stage	1974-97B	1974 Dec 10.30 5 years?	Cylinder 1815	8.6 long 3.0 dia	1974 Dec 10.5	31.77	4175	85880	1770	157235	0.905	216
D R	Cosmos 697†	1974-98A	1974 Dec 13.57 11.6 days 1974 Dec 25.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1974 Dec 14.4	62.80	90.16	6661	174	392	0.016	68
D	Cosmos 697 rocket	1974-98B	1974 Dec 13.57 7.70 days 1974 Dec 21.27	Cylinder 2500?	7.5 long 2.6 dia	1974 Dec 14.7	62.79	89.95	6651	171	375	0.015	66
D	Cosmos 697 engine?*	1974-98D	1974 Dec 13.57 13 days 1974 Dec 26	Cone 600? Full	1.5 long? 2 dia?	1974 Dec 25.3	62.80	89.86	6647	177	360	0.014	61
D	Fragments	1974-98C,E											
	Meteor 20	1974-99A	1974 Dec 17.49 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1974 Dec 24.0	81.24	102.38	7248	842	897	0.004	262
	Meteor 20 rocket	1974-99B	1974 Dec 17.49 400 years	Cylinder 1440	3.8 long 2.6 dia	1974 Dec 22.6	81.24	102.39	7248	820	920	0.007	207
	Cosmos 698	1974-100A	1974 Dec 18.59 8 years	Cylinder + paddles? 900?	2 long? 1 dia?	1974 Dec 20.6	74.04	95.32	6912	515	552	0.003	7

Space Vehicle: Helios 1, 1974-97A; Helios 1 rocket, 1974-97C.

* 1974-98D ejected from 1974-98A about 1974 Dec 25.

† Probably manoeuvrable.

1974-100 continued on page 388

Year of launch 1974 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 698 rocket	1974-100B	1974 Dec 18.59 7 years	Cylinder 2200?	7.4 long 2.4 dia	1974 Dec 21.9	74.04	95.22	6907	505	552	0.003	6
5d	Fragments	1974-100C-J											
T	Symphonie 1*	1974-101A	1974 Dec 19.11 >million years	Octagon + 3 paddles 402 full 221 empty	0.58 long 1.85 dia	1974 Dec 19.1 1974 Dec 21.7 1975 May 1.0	13.23 1.18 0.2	688.4 1646.6 1436.1	25826 46190 42165	395 38705 35768	38500 40919 35806	0.738 0.024 0.0005	178 218 -
D	Symphonie 1 second stage	1974-101B	1974 Dec 19.11 1217 days 1978 Apr 19	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1974 Dec 20.8	27.01	98.44	7070	283	1101	0.058	149
	Symphonie 1 third stage	1974-101G	1974 Dec 19.11 100 years	Sphere-cone 66	1.32 long 0.94 dia	1976 Nov 1.0	12.80	682.8	25685	409	38204	0.736	-
D	Fragments	1974-101C-F											
	Molniya 2L	1974-102A	1974 Dec 21.10 14 years	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia	1974 Dec 23.2 1974 Dec 26.2	62.90 62.87	736.77 718.28	27022 26569	659 611	40629 39771	0.740 0.737	289 288
D	Molniya 2L launcher rocket	1974-102B	1974 Dec 21.10 81.53 days 1975 Mar 12.63	Cylinder 2500?	7.5 long 2.6 dia	1974 Dec 22.2	62.85	92.53	6778	217	582	0.027	121
D	Molniya 2L launcher	1974-102C	1974 Dec 21.10 77 days 1975 Mar 8	Irregular	-	1974 Dec 22.2	62.82	92.91	6797	211	626	0.031	122
	Molniya 2L rocket	1974-102D	1974 Dec 21.10 14 years	Cylinder 440	2.0 long 2.0 dia	1974 Dec 23.2	62.89	733.95	26954	616	40536	0.740	288

* Symphonie is a French-German satellite, launched by NASA.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 699*	1974-103A	1974 Dec 24.46 1027 days 1977 Oct 16	Cylinder?	-	1974 Dec 24.5	64.99	89.80	6644	114	418	0.023	52
						1974 Dec 26.1	65.03	93.31	6812	428	440	0.001	265
D	Cosmos 699 rocket	1974-103B	1974 Dec 24.46 1 day 1974 Dec 25	Cylinder 1500?	8 long? 2.5 dia?	1974 Dec 24.7	65.06	89.22	6614	114	358	0.018	63
D	Fragments	1974-103C-BC											
D	Salyut 4 †	1974-104A	1974 Dec 26.18 769.80 days 1977 Feb 2.98	Cylinder + 3 wings 18900	14 long 4.15 to 2.0 dia	1974 Dec 27.0	51.57	89.08	6610	212	251	0.003	81
						1974 Dec 30.2	51.57	90.65	6687	276	341	0.005	328
						1975 Jan 17.4	51.58	91.32	6721	336	349	0.001	304
D	Salyut 4 rocket	1974-104B	1974 Dec 26.18 6.81 days 1975 Jan 1.99	Cylinder 4000?	12 long? 4 dia	1974 Dec 27.0	51.58	88.83	6597	207	231	0.002	52
D	Fragments	1974-104C-U											
	Cosmos 700	1974-105A	1974 Dec 26.50 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1974 Dec 26.8	82.96	104.80	7361	966	999	0.002	300
	Cosmos 700 rocket	1974-105B	1974 Dec 26.50 600 years	Cylinder 2200?	7.4 long 2.4 dia	1974 Dec 27.5	82.95	104.68	7355	964	989	0.002	295
D	Cosmos 701	1974-106A	1974 Dec 27.38 12.88 days 1975 Jan 9.26	Sphere- cylinder 6300?	6.5 long? 2.4 dia	1974 Dec 28.0	71.39	89.77	6640	205	319	0.009	47
R						1974 Dec 29.3	71.38	89.37	6620	170	314	0.011	56
D	Cosmos 701 rocket	1974-106B	1974 Dec 27.38 11.31 days 1975 Jan 7.69	Cylinder 2500?	7.5 long 2.6 dia	1974 Dec 28.4	71.39	89.69	6636	202	314	0.008	45
D	Cosmos 701 engine**	1974-106F	1974 Dec 27.38 18.99 days 1975 Jan 15.37	Cone 600? Full	1.5 long? 2 dia?	1975 Jan 8.7	71.43	89.59	6631	175	331	0.012	34
D	Fragments	1974-106C-E,G											

* Partially disintegrated on 1975 Apr 17.91, near 3 deg North, 82 deg West.

** 1974-106F ejected from 1974-106A about 1975 Jan 8.

† De-orbited on command.

Year of launch 1975

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Soyuz 17*	1975-01A	1975 Jan 10.90	Sphere-cylinder	7.5 long	1975 Jan 11.0	51.63	88.79	6595	185	249	0.005	88
2M			29.56 days	6570?	2.2 dia	1975 Jan 11.6	51.58	90.69	6689	274	347	0.005	266
R			1975 Feb 9.46			1975 Jan 17.4	51.58	91.32	6721	336	349	0.001	304
D	Soyuz 17 rocket	1975-01B	1975 Jan 10.90 3.11 days 1975 Jan 14.01	Cylinder 2500?	7.5 long 2.6 dia	1975 Jan 11.7	51.63	88.59	6585	181	233	0.004	87
D	Fragments	1975-01C-J											
D	Cosmos 702	1975-02A	1975 Jan 17.38	Sphere-cylinder	5.0 long	1975 Jan 18.6	71.33	89.70	6637	205	313	0.008	50
R			11.90 days	5700?	2.4 dia								
			1975 Jan 29.28										
D	Cosmos 702 rocket	1975-02B	1975 Jan 17.38 11.99 days 1975 Jan 29.37	Cylinder 2500?	7.5 long 2.6 dia	1975 Jan 18.4	71.35	89.57	6631	202	304	0.008	39
D	Fragment	1975-02C											
D	Cosmos 703	1975-03A	1975 Jan 21.46	Ellipsoid	1.8 long	1975 Jan 22.4	81.96	102.11	7236	197	1518	0.091	72
			303 days	400?	1.2 dia								
			1975 Nov 20										
D	Cosmos 703 rocket	1975-03B	1975 Jan 21.46 213 days 1975 Aug 22	Cylinder 1500?	8 long 1.65 dia	1975 Jan 22.2	81.96	101.87	7225	200	1493	0.089	73
T	Landsat 2 (ERTS 2)	1975-04A	1975 Jan 22.75 100 years	Cone + 2 paddles 953	3.0 long 1.45 dia	1975 Jan 25.4	99.09	103.28	7291	907	918	0.001	266
	Landsat 2** second stage	1975-04B	1975 Jan 22.75 disintegrated	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1975 Jan 25.3	97.83	101.51	7208	743	916	0.012	211
82d	Fragments	1975-04C-HF											

* Soyuz 17 docked with Salyut 4 about 1975 Jan 12.04; separated 1975 Feb 9.26.

** Disintegrated about 1976 Feb 5.43

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 704	1975-05A	1975 Jan 23.46	Sphere-cylinder	6.5 long?	1975 Jan 24.8	72.86	89.62	6633	205	305	0.008	68
R			13.74 days	6300?	2.4 dia	1975 Jan 27.4	72.87	89.25	6615	169	304	0.010	60
			1975 Feb 6.20										
D	Cosmos 704 rocket	1975-05B	1975 Jan 23.46	Cylinder	7.5 long	1975 Jan 24.8	72.86	89.47	6626	203	293	0.007	62
			11.09 days	2500?	2.6 dia								
			1975 Feb 3.55										
D	Cosmos 704 engine	1975-05F	1975 Jan 23.46	Cone	1.5 long?	1975 Feb 2.9	72.83	89.39	6622	166	321	0.012	45
			15 days	600?	2 dia?								
			1975 Feb 7	Full									
D	Fragments	1975-05C-E,G-J											
D	Cosmos 705	1975-06A	1975 Jan 28.50	Ellipsoid	1.8 long	1975 Jan 28.7	70.97	92.29	6765	271	502	0.017	78
			294 days	400?	1.2 dia								
			1975 Nov 18										
D	Cosmos 705 rocket	1975-06B	1975 Jan 28.50	Cylinder	8 long	1975 Jan 29.1	70.97	92.12	6756	273	483	0.016	78
			148 days	1500?	1.65 dia								
			1975 Jun 25										
	Cosmos 706	1975-07A	1975 Jan 30.63	Windmill + 6 vanes	4.2 long?	1975 Jan 31.2	62.85	719.55	26602	623	39824	0.737	318
			30 years	1250?	1.6 dia								
D	Cosmos 706 launcher rocket	1975-07B	1975 Jan 30.63	Cylinder	7.5 long	1975 Jan 31.7	62.82	92.53	6778	214	585	0.027	119
			63.98 days	2500?	2.6 dia								
			1975 Apr 4.61										
D	Cosmos 706 launcher	1975-07C	1975 Jan 30.63	Irregular	-	1975 Jan 31.8	62.89	92.62	6782	179	629	0.033	118
			30.29 days										
			1975 Mar 1.92										
	Cosmos 706 rocket	1975-07D	1975 Jan 30.63	Cylinder	2.0 long	1975 Jan 31.7	62.87	716.77	26530	630	39674	0.736	318
			30 years	440	2.0 dia								

Year of launch 1975 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 707	1975-08A	1975 Feb 5.55 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1975 Feb 6.7	74.03	95.14	6903	503	547	0.003	338
	Cosmos 707 rocket	1975-08B	1975 Feb 5.55 10 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Feb 6.5	74.03	95.04	6898	494	546	0.004	348
D	Fragments	1975-08C-E											
	Molniya 2M	1975-09A	1975 Feb 6.20 10¾ years	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia	1975 Feb 6.8 1975 Feb 23.3	62.78 62.81	736.86 717.59	27025 26552	634 602	40660 39745	0.741 0.737	289 289
D	Molniya 2M launcher rocket	1975-09B	1975 Feb 6.20 78.57 days 1975 Apr 25.77	Cylinder 2500?	7.5 long 2.6 dia	1975 Feb 6.3	62.84	92.68	6784	216	596	0.028	119
D	Molniya 2M launcher	1975-09C	1975 Feb 6.20 76.19 days 1975 Apr 23.39	Irregular	-	1975 Feb 8.3	62.83	92.87	6794	212	620	0.030	121
	Molniya 2M rocket	1975-09D	1975 Feb 6.20 10¾ years	Cylinder 440	2.0 long 2.0 dia	1975 Feb 7.3	62.82	733.33	26939	612	40510	0.741	289
T L	Starlette* [Diamant B]	1975-10A	1975 Feb 6.69 2000 years	Quasi-sphere 47	0.26 dia	1975 Feb 20.6	49.82	104.13	7335	806	1108	0.021	75
	Starlette rocket	1975-10B	1975 Feb 6.69 200 years	Cylinder 68	1.60 long? 0.65 dia	1975 Feb 21.6	49.82	104.43	7349	804	1138	0.023	78
	Fragments	1975-10C-E											

* Satellite de Taille Adaptée avec Réflecteurs Laser pour les ETudes de la TErre.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	SMS 2*	1975-11A	1975 Feb 6.92 > million years	Cylinder 627 full 243 empty	2.30 long 1.90 dia	1975 Feb 13.6 1975 Apr 1.0	1.10 1.0	1456.4 1436.2	42561 42167	35680 35778	36685 35799	0.012 0.0003	- -
	SMS 2 second stage	1975-11B	1975 Feb 6.92 6 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1975 Feb 10.9	27.67	121.64	8142	278	3249	0.182	250
D	SMS 2 third stage	1975-11F	1975 Feb 6.92 4 years?	Sphere-cone 66	1.32 long 0.94 dia	Orbit similar to 1974-33D							
D	Fragments	1975-11C-E											
	Cosmos 708	1975-12A	1975 Feb 12.14 6000 years	Cylinder? 500?	-	1975 Feb 14.6	69.23	113.58	7769	1369	1413	0.003	271
	Cosmos 708 rocket	1975-12B	1975 Feb 12.14 4000 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Feb 14.3	69.22	113.43	7762	1367	1400	0.002	260
D	Cosmos 709	1975-13A	1975 Feb 12.61	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1975 Feb 14.5	62.83	89.39	6624	181	310	0.010	68
R			12.65 days 1975 Feb 25.26			1975 Feb 22.1	62.83	89.42	6625	179	315	0.010	68
D	Cosmos 709 rocket	1975-13B	1975 Feb 12.61 5.17 days 1975 Feb 17.78	Cylinder 2500?	7.5 long 2.6 dia	1975 Feb 14.5	62.82	89.05	6607	177	280	0.008	64
D	Cosmos 709 engine**	1975-13F	1975 Feb 12.61 17.03 days 1975 Mar 1.64	Cone 600? full	1.5 long? 2 dia?	1975 Feb 24.3	62.82	88.96	6602	179	269	0.007	76
D	Fragments	1975-13C-E,G											

* An apogee motor may have separated into a similar orbit.

** 1975-13F ejected from 1975-13A about 1975 Feb 24.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Taiyo (SRATS)* [Mu 3C]	1975-14A	1975 Feb 24.23 5¼ years	Octagonal cylinder 86	0.65 long 0.75 dia	1975 Feb 25.1	31.54	120.06	8067	249	3129	0.179	115
	Taiyo rocket	1975-14B	1975 Feb 24.23 5¼ years	Sphere-cone 230?	2.33 long 1.14 dia	1975 Mar 5.6	31.55	120.17	8072	257	3131	0.178	167
D R	Cosmos 710†	1975-15A	1975 Feb 26.38 13.83 days 1975 Mar 12.21	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1975 Feb 27.1	64.99	89.61	6634	176	335	0.012	62
D	Cosmos 710 rocket	1975-15B	1975 Feb 26.38 5.48 days 1975 Mar 3.86	Cylinder 2500?	7.5 long 2.6 dia	1975 Feb 27.1	64.99	89.42	6624	174	318	0.011	59
D	Cosmos 710 engine	1975-15E	1975 Feb 26.38 18.01 days 1975 Mar 16.39	Cone 600? Full	1.5 long? 2 dia?	1975 Mar 12.5	64.99	88.94	6601	168	278	0.008	-
D	Fragments	1975-15C,D											
	Cosmos 711	1975-16A	1975 Feb 28.58 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Mar 2.9	74.00	115.53	7857	1462	1496	0.002	150
	Cosmos 712	1975-16B	1975 Feb 28.58 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Mar 2.9	74.00	114.95	7831	1413	1492	0.005	117
	Cosmos 713	1975-16C	1975 Feb 28.58 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Mar 1.6	74.00	114.75	7822	1398	1490	0.006	108

* Solar Radiation and Thermospheric Satellite. Japanese satellite.

† Manoeuvrable.

1975-16 continued on page 395

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 714	1975-16D	1975 Feb 28.58 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Mar 2.9	74.00	115.33	7848	1446	1494	0.003	131
	Cosmos 715	1975-16E	1975 Feb 28.58 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Mar 4.2	74.00	115.75	7867	1470	1508	0.002	181
	Cosmos 716	1975-16F	1975 Feb 28.58 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Mar 4.2	74.00	115.96	7877	1480	1517	0.002	214
	Cosmos 717	1975-16G	1975 Feb 28.58 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Mar 4.2	74.00	116.21	7888	1481	1538	0.004	228
	Cosmos 718	1975-16H	1975 Feb 28.58 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Mar 2.0	74.01	115.14	7839	1430	1492	0.004	122
	Cosmos 711 rocket	1975-16J	1975 Feb 28.58 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Mar 2.9	74.01	118.08	7972	1484	1704	0.014	261
T	Satellite Data System 1 [Titan 3B Agena D]	1975-17A	1975 Mar 10.20 10 years?	Cylinder?	-	1975 Mar 15.0	63.5	702.0	26194	295	39337	0.745	270
	Agena D rocket	1975-17B*	1975 Mar 10.20 10 years?	Cylinder 700	6 long? 1.5 dia	1975 Apr 1.0	63.5	708.0	26290	305	39518	0.746	-

* 1975-17B may be a second payload.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 719	1975-18A	1975 Mar 12.37	Sphere-cylinder	6.5 long?	1975 Mar 13.0	64.98	89.32	6619	175	307	0.010	63
R			12.86 days	6300?	2.4 dia	1975 Mar 16.2	64.99	89.44	6625	174	320	0.011	60
			1975 Mar 25.23										
D	Cosmos 719 rocket	1975-18B	1975 Mar 12.37	Cylinder	7.5 long	1975 Mar 14.5	64.99	88.69	6589	164	257	0.007	58
			4.08 days	2500?	2.6 dia								
			1975 Mar 16.45										
D	Cosmos 719 engine*	1975-18E	1975 Mar 12.37	Cone	1.5 long?	1975 Mar 24.7	64.98	89.16	6612	172	295	0.009	56
			18.50 days	600?	2 dia?								
			1975 Mar 30.87	Full									
D	Fragments	1975-18C,D,F											
D	Cosmos 720	1975-19A	1975 Mar 21.29	Sphere-cylinder	5.9 long	1975 Mar 24.2	62.81	89.33	6621	212	273	0.005	233
R			11.6 days	5900?	2.4 dia								
			1975 Apr 1.9										
D	Cosmos 720 rocket	1975-19B	1975 Mar 21.29	Cylinder	7.5 long	1975 Mar 24.6	62.80	89.09	6609	209	252	0.003	257
			9.38 days	2500?	2.6 dia								
			1975 Mar 30.67										
D	Capsule**	1975-19F	1975 Mar 21.29	Ellipsoid	0.9 long	1975 Apr 2.1	62.79	89.12	6610	206	258	0.004	240
			15 days	200?	1.9 dia								
			1975 Apr 5										
D	Fragments	1975-19C-E,G-J											
D	Cosmos 721	1975-20A	1975 Mar 26.37	Sphere-cylinder	5.9 long	1975 Mar 27.7	81.33	88.88	6596	208	228	0.002	327
R			11.85 days	5900?	2.4 dia								
			1975 Apr 7.22										
D	Cosmos 721 rocket	1975-20B	1975 Mar 26.37	Cylinder	7.5 long	1975 Mar 27.0	81.33	88.78	6591	199	227	0.002	321
			3.58 days	2500?	2.6 dia								
			1975 Mar 29.95										

* 1975-18E ejected from 1975-19A about 1975 Mar 24

** 1975-19F ejected from 1975-19A about 1975 Apr 1

1975-20 continued on page 397

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Capsule	1975-20F	1975 Mar 26.37 15.27 days 1975 Apr 10.64	Ellipsoid 200?	0.9 long 1.9 dia	1975 Apr 8.7	81.33	88.26	6566	177	198	0.002	270
D	Fragments	1975-20C-E											
D	Cosmos 722	1975-21A	1975 Mar 27.34	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1975 Mar 28.3	71.35	89.94	6649	204	337	0.010	54
R			12.88 days 1975 Apr 9.22			1975 Mar 28.8	71.35	89.62	6633	173	336	0.012	53
D	Cosmos 722 rocket	1975-21B	1975 Mar 27.34 13.17 days 1975 Apr 9.51	Cylinder 2500?	7.5 long 2.6 dia	1975 Mar 28.3	71.35	89.82	6643	203	326	0.009	52
D	Cosmos 722 engine	1975-21G	1975 Mar 27.34 18.17 days 1975 Apr 14.51	Cone 600? full	1.5 long? 2 dia?	1975 Apr 9.9	71.35	89.12	6608	172	287	0.009	26
D	Fragments	1975-21C-F,H											
	Intercosmos 13	1975-22A	1975 Mar 27.61 5½ years	Octagonal ellipsoid 550?	1.8 long? 1.5 dia?	1975 Mar 28.8	82.95	104.88	7365	284	1689	0.095	64
	Intercosmos 13 rocket	1975-22B	1975 Mar 27.61 5.1 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Mar 28.9	82.95	104.74	7358	278	1681	0.095	64
	Meteor 21	1975-23A	1975 Apr 1.52 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1975 Apr 1.9	81.21	102.59	7258	867	893	0.002	269
	Meteor 21 rocket	1975-23B	1975 Apr 1.52 400 years	Cylinder 1440	3.8 long 2.6 dia	1975 Apr 2.7	81.22	102.65	7261	845	920	0.005	201

Year of launch 1975 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 723*	1975-24A	1975 Apr 2.46 600 years	Cone-cylinder	6 long? 2 dia?	1975 Apr 2.7 1975 May 16.3	65.02 64.7	89.64 103.74	6636 7313	249 917	266 952	0.001 0.002	258 -
D	Cosmos 723 rocket	1975-24B	1975 Apr 2.46 49 days 1975 May 21	Cylinder 1500?	8 long? 2.5 dia?	1975 May 16.0	65.00	89.59	6633	251	259	0.001	228
D	Cosmos 723 platform	1975-24D	1975 Apr 2.46 104 days 1975 Jul 15	Irregular	-	1975 May 15.9	65.01	89.66	6637	254	263	0.001	274
D	Fragments	1975-24C,E,F											
	Cosmos 724**	1975-25A	1975 Apr 7.46 600 years	Cone-cylinder	6 long? 2 dia?	1975 Apr 8.3 1975 Jun 12.5	64.97 65.5	89.63 103.04	6635 7281	248 869	266 937	0.001 0.005	255 -
D	Cosmos 724 platform	1975-25B	1975 Apr 7.46 122 days 1975 Aug 7	Irregular	-	1975 Jun 12.0	64.95	89.59	6633	248	262	0.001	319
D	Cosmos 724 rocket	1975-25C	1975 Apr 7.46 71 days 1975 Jun 17	Cylinder 1500?	8 long? 2.5 dia?	1975 Jun 12.5	64.96	89.49	6628	245	255	0.001	310
D	Cosmos 725	1975-26A	1975 Apr 8.77 273 days 1976 Jan 6	Ellipsoid 400?	1.8 long. 1.2 dia	1975 Apr 9.4	70.99	92.08	6754	270	481	0.016	78
D	Cosmos 725 rocket	1975-26B	1975 Apr 8.77 154 days 1975 Sep 9	Cylinder 1500?	8 long 1.65 dia	1975 Apr 8.8	70.98	91.90	6745	272	461	0.014	81

* 1975-24B and 24D attached to 1975-24A until orbit change about 1975 May 16.31.

** 1975-25B and 25C attached to 1975-25A until orbit change about 1975 Jun 12.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T L	GEOS 3*	1975-27A	1975 Apr 10.00 200 years	Octahedron + pyramid 241	1.11 high 1.22 wide	1975 Apr 10.3	114.96	101.82	7224	839	853	0.001	315
	GEOS 3 second stage	1975-27B	1975 Apr 10.00 80 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1975 Apr 10.4	114.98	101.67	7216	833	843	0.0007	278
	Fragments	1975-27C-E											
	Cosmos 726	1975-28A	1975 Apr 11.33 1200 years	Cylinder? 700?	1.3 long? 1.9 dia	1975 Apr 11.6	82.99	104.65	7354	956	996	0.003	293
	Cosmos 726 rocket	1975-28B	1975 Apr 11.33 600 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Apr 12.9	82.99	104.50	7347	956	981	0.002	278
	Molniya 3B	1975-29A	1975 Apr 14.75 14½ years	Windmill + 6 vanes 1500?	4.2 long? 1.6 dia	1975 Apr 16.8 1975 Apr 27.9	62.86 62.86	736.35 717.54	27013 26550	608 592	40661 39752	0.741 0.737	288 288
D	Molniya 3B launcher rocket	1975-29B	1975 Apr 14.75 67 days 1975 Jun 20	Cylinder 2500?	7.5 long 2.6 dia	1975 Apr 19.8	62.85	92.26	6764	217	555	0.025	123
D	Molniya 3B launcher	1975-29C	1975 Apr 14.75 51 days 1975 Jun 4	Irregular	-	1975 Apr 20.6	62.86	92.43	6773	196	593	0.029	117
	Molniya 3B rocket	1975-29D	1975 Apr 14.75 14½ years	Cylinder 440	2.0 long 2.0 dia	1975 Apr 22.4	62.85	733.16	26934	606	40506	0.741	288

* Geodynamic Experimental Ocean Satellite

Year of launch 1975 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 727†	1975-30A	1975 Apr 16.34 11.87 days 1975 Apr 28.21	Sphere-cylinder 630 0?	6.5 long? 2.4 dia	1975 Apr 18.6	64.98	89.55	6631	172	334	0.012	68
D	Cosmos 727 rocket	1975-30B	1975 Apr 16.34 4.99 days 1975 Apr 21.33	Cylinder 250 0?	7.5 long 2.6 dia	1975 Apr 18.4	64.99	89.07	6607	168	290	0.009	63
D	Cosmos 727 engine*	1975-30D	1975 Apr 16.34 19.01 days 1975 May 5.35	Cone 600? full	1.5 long? 2 dia?	1975 Apr 27.4	64.98	89.31	6619	168	314	0.001	64
D	Fragments	1975-30C,E											
D R	Cosmos 728	1975-31A	1975 Apr 18.42 10.79 days 1975 Apr 29.21	Sphere-cylinder 590 0?	5.9 long 2.4 dia	1975 Apr 20.7	72.83	89.80	6642	205	323	0.009	65
D	Cosmos 728 rocket	1975-31B	1975 Apr 18.42 11.59 days 1975 Apr 30.01	Cylinder 250 0?	7.5 long 2.6 dia	1975 Apr 25.2	72.82	89.03	6604	189	263	0.006	45
D	Capsule **	1975-31G	1975 Apr 18.42 27.90 days 1975 May 16.32	Ellipsoid 200?	0.9 long 1.9 dia	1975 Apr 28.8	72.83	89.67	6636	200	315	0.009	45
D	Fragments	1975-31C-F											
D	[Titan 3B Agena D]	1975-32A	1975 Apr 18.70 48 days 1975 Jun 5	Cylinder 300 0?	8 long? 1.5 dia	1975 Apr 20.9	110.54	89.86	6646	134	401	0.020	155
	Aryabhata††	1975-33A	1975 Apr 19.32 10 years	Polyhedron 360	1.1 high 1.47 dia	1975 Apr 21.2	50.68	96.41	6968	569	610	0.003	36
	Aryabhata rocket	1975-33B	1975 Apr 19.32 10 years	Cylinder 220 0?	7.4 long 2.4 dia	1975 Apr 25.1	50.68	96.31	6963	559	611	0.004	62
D	Fragments	1975-33C,D											

* 1975-30D ejected from 1975-30A about 1975 Apr 27.

** 1975-31G ejected from 1975-31A about 1975 Apr 28.

† Manoeuvrable

†† First Indian satellite, launched by USSR.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 729	1975-34A	1975 Apr 22.88 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1975 Apr 24.9	82.97	105.05	7374	980	1011	0.002	267
	Cosmos 729 rocket	1975-34B	1975 Apr 22.88 600 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Apr 24.9	82.96	104.93	7368	979	1001	0.001	258
D	Cosmos 730	1975-35A	1975 Apr 24.34 11.85 days 1975 May 6.19	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1975 Apr 25.4 1975 Apr 30.4	81.33 81.33	88.96 88.91	6600 6598	210 170	234 269	0.002 0.008	2 57
R													
D	Cosmos 730 rocket	1975-35B	1975 Apr 24.34 5.36 days 1975 Apr 29.70	Cylinder 2500?	7.5 long 2.6 dia	1975 Apr 25.3	81.32	88.78	6591	201	225	0.002	339
D	Cosmos 730 engine*	1975-35E	1975 Apr 24.34 13 days 1975 May 7	Cone 600? full	1.5 long? 2 dia?	1975 May 5.5	81.33	88.66	6585	166	248	0.006	40
D	Fragments	1975-35C,D,F,G											
	Molniya 1AE	1975-36A	1975 Apr 29.44 100 years?	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1975 Apr 30.0 1975 Jul 1.0	62.83 62.9	736.47 717.69	27016 26554	430 446	40852 39906	0.748 0.743	280 -
D	Molniya 1AE launcher rocket	1975-36B	1975 Apr 29.44 29.61 days 1975 May 29.05	Cylinder 2500?	7.5 long 2.6 dia	1975 Apr 30.3	62.84	90.78	6691	213	413	0.015	128
D	Molniya 1AE launcher	1975-36C	1975 Apr 29.44 35 days 1975 Jun 3	Irregular	-	1975 Apr 30.6	62.81	91.21	6713	210	459	0.019	130
	Molniya 1AE rocket	1975-36D	1975 Apr 29.44 100 years?	Cylinder 440	2.0 long 2.0 dia	1975 May 3.6	62.89	732.85	26927	401	40696	0.748	280

* 1975-35E ejected from 1975-35A about 1975 May 5.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Explorer 53 (SAS 3)	1975-37A	1975 May 7.95 1433 days 1979 Apr 9	Cylinder + 4 paddles 193	0.61 long 0.66 dia	1975 May 12.3	2.99	94.49	6882	499	508	0.0006	280
D	Explorer 53 rocket	1975-37B	1975 May 7.95 1586 days 1979 Sep 9	Cylinder 24	1.50 long 0.46 dia	1975 May 16.2	2.99	94.47	6881	498	507	0.0006	325
T	Telesat 3 (Anik 3)	1975-38A	1975 May 7.98 > million years	Cylinder 565 full 295 empty	1.52 long 1.83 dia	1975 May 8.0 1975 May 12.8 1975 Jul 1.0	24.8 0.05 0.05	634.3 1424.8 1436.2	24453 41956 42166	231 35222 35786	35919 35933 35789	0.730 0.008 0	- 129 -
D	Telesat 3 second stage	1975-38B	1975 May 7.98 545 days 1976 Nov 3	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1975 May 8.0	28.36	109.33	7580	220	2185	0.130	230
	Telesat 3 third stage	1975-38D	1975 May 7.98 20 years	Sphere-cone 66	1.32 long 0.94 dia	1975 May 8.0	24.75	638.6	24576	239	36156	0.731	178
D	Fragment	1975-38C											
D	Pollux-D5A* (microrocket)	1975-39A	1975 May 17.44 80 days 1975 Aug 5	Double cone 35	0.56 long 0.61 dia	1975 May 19.2	29.96	100.24	7154	269	1283	0.071	44
D L	Castor-D5B* (accelerometer)	1975-39B	1975 May 17.44 1373 days 1979 Feb 18	Polyhedron 77	0.75 long 0.75 dia	1975 May 19.1	29.95	100.11	7148	272	1268	0.070	43
D	Diamant B rocket	1975-39C	1975 May 17.44 448 days 1976 Aug 7	Cylinder 68	1.60 long? 0.65 dia	1975 May 19.0	29.95	99.92	7139	271	1251	0.069	42
D	Fragments	1975-39D-G											

* French satellites.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	DSCS 5 [Titan 3C]	1975-40A	1975 May 20.59 6 days 1975 May 26	Cylinder + 2 dishes 565	1.83 long 2.74 dia	1975 May 21.2	28.58	88.34	6578	150	249	0.008	125
D	DSCS 6	1975-40B	1975 May 20.59 6 days 1975 May 26	Cylinder + 2 dishes 565	1.83 long 2.74 dia	1975 May 21.2	28.59	88.00	6561	143	222	0.006	111
D	Transtage	1975-40C	1975 May 20.59 1 day 1975 May 21	Cylinder 10000? full	6 long? 3.0 dia	1975 May 20.7	28.59	88.24	6573	150	239	0.007	117
D R	Cosmos 731	1975-41A	1975 May 21.29 11.9 days 1975 Jun 2.2	Sphere-cylinder 5900?	5.9 long 2.4 dia	1975 May 22.2	64.97	89.49	6628	203	296	0.007	44
D	Cosmos 731 rocket	1975-41B	1975 May 21.29 8.74 days 1975 May 30.03	Cylinder 2500?	7.5 long 2.6 dia	1975 May 22.3	64.97	89.33	6620	202	281	0.006	41
D	Capsule*	1975-41H	1975 May 21.29 29 days 1975 Jun 19	Ellipsoid 200?	0.9 long 1.9 dia	1975 Jun 1.0	64.97	89.35	6621	199	286	0.007	-
D	Fragments	1975-41C-G											
T	Intelsat 4G (F-1)	1975-42A	1975 May 22.92 > million years	Cylinder 1410 full 720 empty	2.82 long 2.39 dia	1975 Jul 1.0 1975 Oct 1.0	0.4 0.15	1446.3 1436.1	42363 42165	35787 35785	36182 35789	0.005 0	- -
	Intelsat 4G rocket	1975-42B	1975 May 22.92 6000 years	Cylinder 1815	8.6 long 3.0 dia	1975 Jun 4.0	26.10	654.71	24986	591	36625	0.721	186

* 1975-41H ejected from 1975-41A about 1975 May 31

Year of launch 1975 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	DMSP [Thor Burner 2]	1975-43A	1975 May 24.14 80 years	12-sided frustum 195	1.64 long? 1.40 to 1.10 dia	1975 May 24.7	98.93	102.00	7231	813	892	0.005	230
	Burner 2 rocket	1975-43B	1975 May 24.14 60 years	Sphere-cone 66	1.32 long 0.94 dia	1975 May 24.4	98.89	101.94	7228	810	889	0.005	230
D	Soyuz 18*	1975-44A	1975 May 24.63	Sphere-cylinder	7.5 long 2.2 dia	1975 May 24.7	51.69	88.60	6586	186	230	0.003	69
2M			62.97 days			1975 May 25.0	51.60	89.45	6628	190	310	0.009	59
R			1975 Jul 26.60	6570?		1975 May 26.3	51.59	91.34	6722	338	349	0.001	258
D	Soyuz 18 rocket	1975-44B	1975 May 24.63 2.41 days 1975 May 27.04	Cylinder 2500?	7.5 long 2.6 dia	1975 May 25.2	51.58	88.48	6580	186	218	0.002	89
D	Fragments	1975-44C-U											
	Cosmos 732	1975-45A	1975 May 28.02 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Jun 1.0	74.02	114.65	7817	1405	1472	0.004	93
	Cosmos 733	1975-45B	1975 May 28.02 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Jun 1.3	74.00	116.30	7892	1472	1555	0.005	256
	Cosmos 734	1975-45C	1975 May 28.02 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 May 29.6	74.01	115.10	7837	1445	1473	0.002	115
	Cosmos 735	1975-45D	1975 May 28.02 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 May 30.6	74.02	115.33	7848	1462	1477	0.001	159
	Cosmos 736	1975-45E	1975 May 28.02 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Jun 1.0	74.02	115.55	7858	1471	1489	0.001	239

* Soyuz 18 docked with Salyut 4 from 1975 May 25.77 to 1975 Jul 26.46.

1975-45 continued on page 405

Year of launch 1975 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 737	1975-45F	1975 May 28.02 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 May 29.5	74.02	116.04	7880	1471	1532	0.004	260
	Cosmos 738	1975-45G	1975 May 28.02 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 May 31.3	74.02	115.80	7869	1469	1512	0.003	242
	Cosmos 739	1975-45H	1975 May 28.02 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Jun 1.3	74.01	114.88	7827	1425	1473	0.003	105
	Cosmos 732 rocket	1975-45J	1975 May 28.02 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Jun 1.6	73.97	118.04	7970	1480	1704	0.014	270
D R	Cosmos 740†	1975-46A	1975 May 28.32 12.9 days 1975 Jun 10.2	Sphere- cylinder 6300?	6.5 long? 2.4 dia	1975 May 29.4	64.97	89.50	6628	173	327	0.012	60
D	Cosmos 740 rocket	1975-46B	1975 May 28.32 6 days 1975 Jun 3	Cylinder 2500?	7.5 long 2.6 dia	1975 May 28.7	64.98	89.44	6625	175	319	0.011	60
D	Cosmos 740 engine*	1975-46D	1975 May 28.32 21 days 1975 Jun 18	Cone 600? full	1.5 long? 2 dia?	1975 Jun 10.5	64.95	89.16	6611	167	299	0.010	55
D	Fragments	1975-46C,E											
D R	Cosmos 741	1975-47A	1975 May 30.28 11.86 days 1975 Jun 11.14	Sphere- cylinder 5700?	5.0 long 2.4 dia	1975 May 30.6	81.34	88.93	6599	210	231	0.002	347
D	Cosmos 741 rocket	1975-47B	1975 May 30.28 6 days 1975 Jun 5	Cylinder 2500?	7.5 long 2.6 dia	1975 May 31.0	81.37	88.79	6592	197	230	0.002	339

* 1975-46D ejected from 1975-46A about 1975 Jun 10.

†Manoeuvrable

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 742	1975-48A	1975 Jun 3.56	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1975 Jun 4.1	62.85	89.82	6645	178	355	0.013	72
R			11.66 days 1975 Jun 15.22			1975 Jun 5.7	62.82	89.25	6617	148	329	0.014	57
D	Cosmos 742 rocket	1975-48B	1975 Jun 3.56 8 days 1975 Jun 11	Cylinder 2500?	7.5 long 2.6 dia	1975 Jun 4.3	62.83	89.67	6637	177	341	0.012	69
D	Cosmos 742 engine*	1975-48D	1975 Jun 3.56 13 days 1975 Jun 16	Cone 600? full	1.5 long? 2 dia?	1975 Jun 14.6	62.84	88.87	6598	143	296	0.012	68
D	Fragments	1975-48C,E											
	Molniya 1AF	1975-49A	1975 Jun 5.07 12 years	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1975 Jun 6.7	62.82	736.82	27024	435	40857	0.748	280
						1975 Jul 1.0	62.83	717.79	26557	435	39922	0.744	-
	SRET 2	1975-49B	1975 Jun 5.07 12 years	Octahedron 29.6	0.56 dia	1975 Jun 5.6	62.83	737.77	27047	513	40825	0.745	280
D	Molniya 1AF launcher	1975-49C	1975 Jun 5.07 41 days 1975 Jul 16	Irregular	-	1975 Jun 5.9	62.84	90.89	6697	213	424	0.016	133
D	Molniya 1AF launcher rocket	1975-49D	1975 Jun 5.07 34 days 1975 Jul 9	Cylinder 2500?	7.5 long 2.6 dia	1975 Jun 5.9	62.83	90.86	6695	202	432	0.017	124
	Molniya 1AF rocket	1975-49F	1975 Jun 5.07 12 years	Cylinder 440	2.0 long 2.0 dia	1976 Feb 3.7	62.87	730.59	26870	742	40240	0.735	281
D	Fragment	1975-49E											

* 1975-48D ejected from 1975-48A about 1975 Jun 14

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Venus 9 launcher rocket	1975-50B	1975 Jun 8.11 1 day 1975 Jun 9	Cylinder 4000?	12 long? 4 dia	1975 Jun 8.4	51.50	88.14	6563	172	198	0.002	45
D	Venus 9 launcher	1975-50C	1975 Jun 8.11 1 day 1975 Jun 9	Irregular	-	1975 Jun 8.7	51.54	88.11	6562	171	196	0.002	46
D	[Titan 3D]	1975-51A	1975 Jun 8.77 150 days 1975 Nov 5	Cylinder 13300? full	15 long 3.0 dia	1975 Jun 9.5	96.38	88.77	6590	154	269	0.009	133
D	Titan 3D rocket	1975-51B	1975 Jun 8.77 3 days 1975 Jun 11	Cylinder 1900	6 long 3.0 dia	1975 Jun 8.9	96.37	88.67	6585	155	259	0.008	141
T?	SSU-A	1975-51C	1975 Jun 8.77 10000 years	Box + aerials?	0.3 x 0.9 x 2.4 ?	1975 Jun 19.4	95.09	113.68	7773	1389	1401	0.001	48
	Fragments	1975-51D,E											
T	Nimbus 6	1975-52A	1975 Jun 12.34 1600 years	Conical skeleton 827	3 long 1.45 dia	1975 Jun 27.0	99.96	107.30	7476	1092	1104	0.0007	212
	Nimbus 6 second stage	1975-52B	1975 Jun 12.34 1000 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1975 Jun 23.9	99.96	107.32	7477	1096	1102	0.0004	206
D	Cosmos 743	1975-53A	1975 Jun 12.52 12.66 days 1975 Jun 25.18	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1975 Jun 13.6	62.80	89.61	6634	181	331	0.011	81
R						1975 Jun 16.4	62.81	89.14	6611	169	297	0.010	60

Space Vehicle: Venus 9, 1975-50A; Venus 9 lander, 1975-50D.

1975-53 continued on page 408

Year of launch 1975 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 743 rocket	1975-53B	1975 Jun 12.52 8 days 1975 Jun 20	Cylinder 2500?	7.5 long 2.6 dia	1975 Jun 13.3	62.79	89.47	6627	179	319	0.010	75
D	Cosmos 743 engine*	1975-53D	1975 Jun 12.52 17 days 1975 Jun 29	Cone 600? full	1.5 long? 2 dia?	1975 Jun 24.4	62.81	89.08	6608	164	296	0.010	62
D	Fragments	1975-53C,E,F											
D	Venus 10 launcher rocket	1975-54B	1975 Jun 14.13 1 day 1975 Jun 15	Cylinder 4000?	12 long? 4 dia	1975 Jun 14.4	51.54	88.09	6561	162	203	0.003	17
D	Venus 10 launcher	1975-54C	1975 Jun 14.13 1 day 1975 Jun 15	Irregular	-	1975 Jun 14.4	51.52	88.12	6562	162	206	0.003	8
T	[Titan 3C]	1975-55A	1975 Jun 18.42 >million years	Cylinder? 1400?	3.3 long? 2.5 dia?	1975 Jul 1.0	9.0	1422	41878	30200	40800	0.127	-
	Transtage	1975-55B	1975 Jun 18.42 >million years	Cylinder 1500?	6 long? 3.0 dia	1975 Jul 1.0	8.0	1416	41428	29700	40400	0.129	-
	Cosmos 744	1975-56A	1975 Jun 20.29 60 years	Cylinder + 2 vanes ? 2500?	5 long? 1.5 dia?	1975 Jun 26.4	81.25	97.11	6997	602	635	0.002	270
	Cosmos 744 rocket	1975-56B	1975 Jun 20.29 60 years	Cylinder 1440	3.8 long 2.6 dia	1975 Jun 27.2	81.27	97.29	7006	586	669	0.006	168

Space Vehicle: Venus 10, 1975-54A; Venus 10 lander, 1975-54D.

* 1975-53D ejected from 1975-53A about 1975 Jun 24

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	OSO 8	1975-57A	1975 Jun 21.49 20 years	Cylinder + vane 1064	0.72 long 1.52 dia	1975 Jun 23.0	32.94	95.53	6930	544	560	0.001	6
	OSO 8 second stage	1975-57B	1975 Jun 21.49 10 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1975 Jun 24.0	32.93	95.46	6927	542	556	0.001	15
D	Cosmos 745	1975-58A	1975 Jun 24.51 262 days 1976 Mar 12	Ellipsoid 400?	1.8 long 1.2 dia	1975 Jun 25.5	71.00	92.35	6767	264	514	0.018	92
D	Cosmos 745 rocket	1975-58B	1975 Jun 24.51 143 days 1975 Nov 14	Cylinder 1500?	8 long 1.65 dia	1975 Jun 25.5	70.99	92.33	6766	264	512	0.018	93
D R	Cosmos 746†	1975-59A	1975 Jun 25.54 12.66 days 1975 Jul 8.20	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1975 Jun 26.7	62.80	89.54	6631	180	325	0.011	70
D	Cosmos 746 rocket	1975-59B	1975 Jun 25.54 6 days 1975 Jul 1	Cylinder 2500?	7.5 long 2.6 dia	1975 Jun 26.5	62.80	89.40	6624	175	316	0.011	64
D	Cosmos 746 engine	1975-59E	1975 Jun 25.54 17 days 1975 Jul 12	Cone 600? full	1.5 long? 2 dia?	1975 Jul 9.4	62.80	88.64	6586	160	256	0.007	65
D	Fragments	1975-59C,D,F											

†Manoeuvrable

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 747	1975-60A	1975 Jun 27.54 11.66 days 1975 Jul 9.20	Sphere-cylinder 5900?	5.9 long 2.4 dia	1975 Jun 27.8	62.83	89.32	6620	193	291	0.007	48
D	Cosmos 747 rocket	1975-60B	1975 Jun 27.54 6 days 1975 Jul 3	Cylinder 2500?	7.5 long 2.6 dia	1975 Jun 27.9	62.82	89.20	6614	189	283	0.007	44
D	Capsule	1975-60F	1975 Jun 27.54 20 days 1975 Jul 17	Ellipsoid 200?	0.9 long 1.9 dia	1975 Jul 10.2	62.83	88.89	6598	185	254	0.005	47
D	Fragments	1975-60C-E,G											
D R	Cosmos 748	1975-61A	1975 Jul 3.57 12.65 days 1975 Jul 16.22	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1975 Jul 4.2 1975 Jul 4.6	62.81 62.82	89.44 89.83	6626 6645	178 178	317 356	0.011 0.013	65 64
D	Cosmos 748 rocket	1975-61B	1975 Jul 3.57 6 days 1975 Jul 9	Cylinder 2500?	7.5 long 2.6 dia	1975 Jul 4.1	62.81	89.34	6621	177	308	0.010	65
D	Cosmos 748 engine*	1975-61F	1975 Jul 3.57 14 days 1975 Jul 17	Cone 600? full	1.5 long? 2 dia?	1975 Jul 16.3	62.84	88.86	6596	164	272	0.008	51
D	Fragments	1975-61C-E											
	Cosmos 749	1975-62A	1975 Jul 4.04 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1975 Jul 5.5	74.04	95.25	6908	509	550	0.003	346
	Cosmos 749 rocket	1975-62B	1975 Jul 4.04 10 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Jul 6.2	74.04	95.14	6902	498	550	0.004	350
	Fragment	1975-62C											

* Ejected from 1975-61A about 1975 Jul 16.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Molniya 2N	1975-63A	1975 Jul 8.21 100 years?	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia	1975 Jul 9.3 1975 Jul 17.8	62.87 62.89	736.87 719.03	27025 26587	432 460	40862 39958	0.748 0.743	280 280
D	Molniya 2N launcher rocket	1975-63B	1975 Jul 8.21 32 days 1975 Aug 9	Cylinder 2500?	7.5 long 2.6 dia	1975 Jul 8.3	62.83	90.71	6688	214	405	0.014	125
D	Molniya 2N launcher	1975-63C	1975 Jul 8.21 32 days 1975 Aug 9	Irregular	-	1975 Jul 8.8	62.83	91.02	6703	204	445	0.018	123
	Molniya 2N rocket	1975-63D	1975 Jul 8.21 100 years?	Cylinder 440	2.0 long 2.0 dia	1975 Jul 9.8	62.87	733.09	26933	436	40674	0.747	280
	Meteor 2-01	1975-64A	1975 Jul 11.18 500 years	Cylinder + 2 vanes 2750?	5 long? 1.5 dia?	1975 Jul 11.5	81.29	102.48	7253	858	891	0.002	247
	Meteor 2-01 rocket	1975-64B	1975 Jul 11.18 400 years	Cylinder 1440	3.8 long 2.6 dia	1975 Jul 20.0	81.29	102.60	7259	839	922	0.006	172
	Fragments	1975-64C,D											
D 2M R	Soyuz 19* (ASTP)	1975-65A	1975 Jul 15.51 5.94 days 1975 Jul 21.45	Sphere-cylinder + 2 wings 6680	7.48 long 2.30 dia	1975 Jul 15.7 1975 Jul 16.7	51.78 51.76	88.49 88.92	6581 6603	186 218	220 231	0.003 0.001	- 270
D	Soyuz 19 rocket	1975-65B	1975 Jul 15.51 2 days 1975 Jul 17	Cylinder 2500?	7.5 long 2.6 dia	1975 Jul 17.1	51.77	87.98	6556	165	190	0.002	21

* Soyuz 19 docked with Apollo 18 from 1975 Jul 17.67 to Jul 19.62.

Year of launch 1975 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D 3M R	Apollo 18 (ASTP)	1975-66A	1975 Jul 15.83 9.06 days 1975 Jul 24.89	Cone-cylinder 12726	10.36 long 3.91 dia	1975 Jul 17.5 1975 Jul 18.0	51.76 51.75	88.41 88.91	6577 6602	170 217	228 231	0.004 0.001	- 277
D	Saturn IVB [Saturn 210]	1975-66B	1975 Jul 15.83 1 day 1975 Jul 16	Cylinder 13600?	18.7 long 6.6 dia	1975 Jul 15.8	51.76	87.56	6535	146	167	0.002	-
D	ASTP docking module*	1975-66C	1975 Jul 15.83 18 days 1975 Aug 2	Cylinder 2012	3.15 long 1.42 dia	1975 Jul 24.3	51.76	88.77	6595	210	224	0.001	-
D	Cosmos 750	1975-67A	1975 Jul 17.38 805.5 days 1977 Sep 29.9	Ellipsoid 400?	1.8 long 1.2 dia	1975 Jul 20.8	71.04	95.40	6916	272	803	0.038	77
D	Cosmos 750 rocket	1975-67B	1975 Jul 17.38 489 days 1976 Nov 17	Cylinder 1500?	8 long 1.65 dia	1975 Jul 20.7	71.04	95.15	6904	277	774	0.036	77
D	Fragment	1975-67C											
D R	Cosmos 751	1975-68A	1975 Jul 23.54 11.64 days 1975 Aug 4.18	Sphere-cylinder 5700?	5.0 long 2.4 dia	1975 Jul 27.3	62.82	89.58	6633	197	313	0.009	61
D	Cosmos 751 rocket	1975-68B	1975 Jul 23.54 7 days 1975 Jul 30	Cylinder 2500?	7.5 long 2.6 dia	1975 Jul 26.5	62.81	89.09	6609	173	288	0.009	55
	Cosmos 752	1975-69A	1975 Jul 24.79 5 years	Cylinder?	4 long? 2 dia?	1975 Jul 25.4	65.85	94.56	6876	481	515	0.002	2
D	Cosmos 752 rocket	1975-69B	1975 Jul 24.79 1565 days 1979 Nov 5	Cylinder 2200?	7.4 long 2.4 dia	1975 Jul 28.0	65.85	94.44	6870	469	514	0.003	6

* Docking Module separated from Saturn 1VB on 1975 Jul 15.88, and attached to Apollo 18 until 1975 Jul 24.13.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	China 3	1975-70A	1975 Jul 26.56 50 days 1975 Sep 14	- 3500?	-	1975 Jul 27.4	69.02	90.98	6701	184	461	0.021	148
D	China 3 rocket	1975-70B	1975 Jul 26.56 30 days 1975 Aug 25	Cylinder	-	1975 Jul 28.0	69.02	90.89	6696	183	453	0.020	146
D	Cosmos 753	1975-71A	1975 Jul 31.54 12.66 days 1975 Aug 13.20	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1975 Jul 31.6 1975 Aug 2.5	62.83 62.83	89.59 89.20	6634 6614	181 170	330 302	0.011 0.010	75 59
R													
D	Cosmos 753 rocket	1975-71B	1975 Jul 31.54 7 days 1975 Aug 7	Cylinder 2500?	7.5 long 2.6 dia	1975 Jul 31.9	62.81	89.51	6630	181	322	0.011	70
D	Cosmos 753 engine*	1975-71D	1975 Jul 31.54 16 days 1975 Aug 16	Cone 600? full	1.5 long? 2 dia?	1975 Aug 12.4	62.82	89.06	6607	161	297	0.010	60
D	Fragments	1975-71C,E											
T	COS-B**	1975-72A	1975 Aug 9.08 10 years	Cylinder 275	1.21 long 1.40 dia	1975 Sep 1.0 1975 Dec 31	90.3 91.9	2203.9 2203.5	56100 56090	442 1800	99002 97630	0.878 0.854	- -
	COS-B second stage	1975-72B	1975 Aug 9.08 15 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1975 Aug 21.5	89.23	139.63	8915	334	4740	0.247	313
	COS-B third stage	1975-72C	1975 Aug 9.08 10 years	Sphere-cone 66	1.32 long 0.94 dia	Orbit similar to 1975-72A							

* 1975-71D ejected from 1975-71A about 1975 Aug 12.

** European Space Agency Celestial Observation Satellite, launched by NASA.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 754	1975-73A	1975 Aug 13.31	Sphere-cylinder	6.5 long?	1975 Aug 14.3	71.37	89.83	6643	204	326	0.009	48
R			12.88 days	6300?	2.4 dia	1975 Aug 15.4	71.37	89.41	6622	172	316	0.011	59
			1975 Aug 26.19										
D	Cosmos 754 rocket	1975-73B	1975 Aug 13.31	Cylinder	7.5 long	1975 Aug 14.4	71.38	89.69	6636	204	312	0.008	45
			12 days	2500?	2.6 dia								
			1975 Aug 25										
D	Cosmos 754 engine*	1975-73D	1975 Aug 13.31	Cone	1.5 long?	1975 Aug 25.0	71.37	89.61	6632	172	336	0.012	40
			18 days	600? full	2 dia?								
			1975 Aug 31										
D	Fragments	1975-73C,E,F											
	Cosmos 755	1975-74A	1975 Aug 14.56	Cylinder?	1.3 long?	1975 Aug 20.1	82.90	105.00	7372	974	1013	0.003	259
			1200 years	700?	1.9 dia?								
	Cosmos 755 rocket	1975-74B	1975 Aug 14.56	Cylinder	7.4 long	1975 Aug 20.4	82.90	104.88	7366	973	1002	0.002	252
			600 years	2200?	2.4 dia								
	Cosmos 756	1975-76A	1975 Aug 22.09	Cylinder + 2 vanes?	5 long?	1975 Aug 25.1	81.24	97.29	7006	622	634	0.001	267
			60 years	2500?	1.5 dia?								
	Cosmos 756 rocket	1975-76B	1975 Aug 22.09	Cylinder	3.8 long	1975 Aug 22.8	81.25	97.42	7013	604	665	0.004	184
			60 years	1440	2.6 dia								

Space Vehicle: Viking 1, 1975-75A; Viking 1 rocket, 1975-75B.

* 1975-73D ejected from 1975-73A about 1975 Aug 24.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Symphonie 2*	1975-77A	1975 Aug 27.07 > million years	Octagon + 3 paddles 402 full 221 empty	0.58 long 1.85 dia	1975 Aug 27.1 1975 Sep 1.0 1976 Jan 1.0	13.16 0.0 0.1	678.3 1427.4 1436.1	25572 41995 42165	413 35364 35776	37974 35870 35797	0.734 0.006 0.0002	178 - -
	Symphonie 2 second stage	1975-77B	1975 Aug 27.07 25 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1975 Aug 29.3	25.34	109.52	7590	407	2016	0.106	188
	Symphonie 2 third stage	1975-77C	1975 Aug 27.07 100 years?	Sphere-cone 66	1.32 long 0.94 dia	1975 Aug 27.1	13.16	678.3	25572	413	37974	0.734	178
D	Fragment	1975-77D											
D R	Cosmos 757	1975-78A	1975 Aug 27.62 12.64 days 1975 Sep 9.26	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1975 Aug 28.7 1975 Aug 29.8	62.82 62.82	89.46 89.24	6627 6616	182 168	316 308	0.010 0.011	72 64
D	Cosmos 757 rocket	1975-78B	1975 Aug 27.62 7 days 1975 Sep 3	Cylinder 2500?	7.5 long 2.6 dia	1975 Aug 28.7	62.82	89.24	6616	180	296	0.009	68
D	Cosmos 757 engine**	1975-78F	1975 Aug 27.62 15 days 1975 Sep 11	Cone 600? full	1.5 long? 2 dia?	1975 Sep 7.1	62.83	89.14	6611	166	300	0.010	63
D	Fragments	1975-78C-E											
	Molniya 1AG	1975-79A	1975 Sep 2.55 10 years	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1975 Sep 3.6 1975 Sep 23.2	62.90 62.87	736.78 717.75	27023 26556	623 606	40667 39749	0.741 0.737	288 288
D	Molniya 1AG launcher rocket	1975-79B	1975 Sep 2.55 69 days 1975 Nov 10	Cylinder 2500?	7.5 long 2.6 dia	1975 Sep 4.1	62.82	92.77	6789	217	604	0.028	120

* Symphonie is a French-German satellite, launched by NASA

** 1975-78F ejected from 1975-78A about 1975 Sep 6.

1975-79 continued on page 416

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Molniya 1AG launcher	1975-79C	1975 Sep 2.55 60 days 1975 Nov 1	Irregular	-	1975 Sep 4.1	62.83	92.75	6788	206	613	0.030	116
	Molniya 1AG rocket	1975-79E	1975 Sep 2.55 10 years	Cylinder 440	2.0 long 2.0 dia	1975 Sep 6.7	62.89	736.04	27005	656	40597	0.740	288
D	Fragment	1975-79D											
D	Cosmos 758*	1975-80A	1975 Sep 5.62 20 days 1975 Sep 25	Sphere- cylinder 6700?	7 long? 2.4 dia	1975 Sep 6.5 1975 Sep 13.2	67.14 67.31	89.50 92.29	6628 6765	174 195	326 579	0.011 0.028	67 31
D	Cosmos 758 rocket	1975-80B	1975 Sep 5.62 5 days 1975 Sep 10	Cylinder 2500?	7.5 long 2.6 dia	1975 Sep 6.2	67.15	89.37	6622	176	311	0.010	68
D	Fragments	1975-80C-CE											
	Molniya 2P	1975-81A	1975 Sep 9.02 100 years?	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia	1975 Sep 13.2 1975 Sep 23.1	62.81 62.92	736.50 717.67	27016 26554	439 449	40837 39902	0.748 0.743	280 280
D	Molniya 2P launcher rocket	1975-81B	1975 Sep 9.02 30 days 1975 Oct 9	Cylinder 2500?	7.5 long 2.6 dia	1975 Sep 10.7	62.85	90.81	6693	213	417	0.015	130
D	Molniya 2P launcher	1975-81C	1975 Sep 9.02 39 days 1975 Oct 18	Irregular	-	1975 Sep 10.1	62.84	91.24	6714	213	459	0.018	129
	Molniya 2P rocket	1975-81D	1975 Sep 9.02 100 years?	Cylinder 440	2.0 long 2.0 dia	1975 Nov 1.0	62.6	733.81	26951	299	40846	0.752	-

* Partially disintegrated about 1975 Sep 6; probably first of 4th-generation observation satellites.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Kiku* (ETS 1)	1975-82A	1975 Sep 9.23 1400 years	26-sided cylinder 85	0.9 long? 0.86 dia	1975 Sep 15.5	46.99	105.88	7417	975	1103	0.009	229
	Kiku rocket [Nu-1]	1975-82B	1975 Sep 9.23 800 years	Cylinder?	-	1975 Oct 3.3	46.98	105.88	7417	975	1103	0.009	296
D R	Cosmos 759	1975-84A	1975 Sep 12.23 11.63 days 1975 Sep 23.86	Sphere-cylinder 5900?	5.9 long 2.4 dia	1975 Sep 12.8	62.80	89.55	6632	231	276	0.003	214
D	Cosmos 759 rocket	1975-84B	1975 Sep 12.23 13 days 1975 Sep 25	Cylinder 2500?	7.5 long 2.6 dia	1975 Sep 13.3	62.79	89.44	6626	236	260	0.002	219
D	Capsule**	1975-84F	1975 Sep 12.23 14 days 1975 Sep 26	Ellipsoid 200?	0.9 long 1.9 dia	1975 Sep 24.3	62.81	89.33	6621	221	264	0.003	218
D	Fragments	1975-84C-E,G											
D R	Cosmos 760	1975-85A	1975 Sep 16.38 13.85 days 1975 Sep 30.23	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1975 Sep 17.2 1975 Sep 18.2	64.96 64.96	89.59 89.38	6633 6623	174 172	335 317	0.012 0.011	59 56
D	Cosmos 760 rocket	1975-85B	1975 Sep 16.38 5 days 1975 Sep 21	Cylinder 2500?	7.5 long 2.6 dia	1975 Sep 17.2	64.97	89.44	6626	172	323	0.011	62
D	Cosmos 760 engine	1975-85D	1975 Sep 16.38 19 days 1975 Oct 5	Cone 600? full	1.5 long? 2 dia?	1975 Sep 29.7	64.96	89.47	6627	167	331	0.012	-
D	Fragments	1975-85C,E,F											

Space Vehicle: Viking 2, 1975-83A; Viking 2 rocket, 1975-83B

* Kiku is a Japanese Engineering Test Satellite.

** 1975-84F ejected from 1975-84A about 1975 Sep 23.

Year of launch 1975 continued

Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
Cosmos 761	1975-86A	1975 Sep 17.30 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Sep 20.5	73.99	114.74	7821	1402	1484	0.005	103
Cosmos 762	1975-86B	1975 Sep 17.30 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Sep 23.6	74.00	115.19	7842	1440	1487	0.003	116
Cosmos 763	1975-86C	1975 Sep 17.30 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Sep 23.6	74.00	115.86	7872	1476	1512	0.002	211
Cosmos 764	1975-86D	1975 Sep 17.30 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Sep 21.6	74.00	116.09	7883	1481	1528	0.003	240
Cosmos 765	1975-86E	1975 Sep 17.30 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Sep 20.5	74.00	116.36	7895	1480	1553	0.005	246
Cosmos 766	1975-86F	1975 Sep 17.30 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Sep 20.6	74.00	114.97	7832	1421	1486	0.004	114
Cosmos 767	1975-86G	1975 Sep 17.30 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Sep 20.6	74.00	115.41	7852	1457	1490	0.002	142
Cosmos 768	1975-86H	1975 Sep 17.30 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1975 Sep 19.9	74.00	115.63	7862	1474	1493	0.001	180
Cosmos 761 rocket	1975-86J	1975 Sep 17.30 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Sep 20.6	74.00	117.87	7963	1483	1687	0.013	261

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Meteor 22	1975-87A	1975 Sep 18.02 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1975 Sep 20.6	81.26	102.36	7248	838	901	0.004	271
	Meteor 22 rocket	1975-87B	1975 Sep 18.02 400 years	Cylinder 1440	3.8 long 2.6 dia	1975 Sep 20.6	81.27	102.50	7254	830	922	0.006	203
D R	Cosmos 769	1975-88A	1975 Sep 23.42 11.76 days 1975 Oct 5.18	Sphere-cylinder 5900?	5.9 long 2.4 dia	1975 Sep 24.3	72.83	89.62	6633	203	307	0.008	66
D	Cosmos 769 rocket	1975-88B	1975 Sep 23.42 8.8 days 1975 Oct 2.2	Cylinder 2500?	7.5 long 2.6 dia	1975 Sep 25.0	72.83	89.43	6624	200	292	0.007	57
D	Capsule*	1975-88C											
	Cosmos 770	1975-89A	1975 Sep 24.50 3000 years	Cylinder? 650?	-	1975 Sep 27.6	82.94	109.21	7568	1169	1210	0.003	259
	Cosmos 770 rocket	1975-89B	1975 Sep 24.50 2000 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Sep 26.5	82.95	109.09	7562	1169	1198	0.002	252
D R	Cosmos 771	1975-90A	1975 Sep 25.41 12.85 days 1975 Oct 8.26	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1975 Sep 25.5 1975 Sep 26.8	81.32 81.33	88.74 88.90	6589 6597	203 217	219 221	0.001 0.0003	178 142
D	Cosmos 771 rocket	1975-90B	1975 Sep 25.41 4 days 1975 Sep 29	Cylinder 2500?	7.5 long 2.6 dia	1975 Sep 26.1	81.34	88.76	6590	206	218	0.0008	329
D	Cosmos 771 engine**	1975-90C	1975 Sep 25.41 17 days 1975 Oct 12	Cone 600? full	1.5 long? 2 dia?	1975 Oct 6.8	81.33	88.86	6595	209	225	0.001	235
D	Fragment	1975-90D											

* 1.9m diameter capsule decayed 1975 Oct 13; life 20 days.

** 1975-90C ejected from 1975-90A about 1975 Oct 6.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Intelsat 4A (F-1)	1975-91A	1975 Sep 26.01 > million years	Cylinder 1500 full 795 empty	2.82 long 2.39 dia	1975 Nov 1.0 1976 Jan 1.0	0.5 0.4	1426.1 1436.1	41969 42164	35358 35752	35823 35819	0.006 0.0008	- -
	Intelsat 4A (F-1) rocket	1975-91B	1975 Sep 26.01 6000 years	Cylinder 1815	8.6 long 3.0 dia	1975 Sep 26.0	21.82	655.16	24982	566	36641	0.722	180
T	Aura* (D2-B)	1975-92A	1975 Sep 27.36 15 years	Cylinder + 4 vanes 110	0.80 long 0.70 dia	1975 Sep 28.1	37.13	96.78	6989	499	723	0.016	0
	Aura rocket [Diamant BP-4]	1975-92B	1975 Sep 27.36 10 years	Cylinder 68	1.60 long? 0.65 dia	1975 Oct 8.7	37.16	96.90	6995	508	726	0.016	84
4d	Fragments	1975-92C-G											
D R?	Cosmos 772	1975-93A	1975 Sep 29.18 3.0 days 1975 Oct 2.2	Sphere-cylinder 6570?	7.5 long 2.3 dia	1975 Sep 30.4	51.79	89.39	6625	195	299	0.008	87
D	Cosmos 772 rocket	1975-93B	1975 Sep 29.18 7 days 1975 Oct 6	Cylinder 2500?	7.5 long 2.6 dia	1975 Sep 30.0	51.81	89.35	6623	196	294	0.007	90
	Cosmos 773	1975-94A	1975 Sep 30.78 120 years	Cylinder + paddles? 750?	2 long? 1 dia?	1975 Oct 1.4	74.06	100.87	7178	791	808	0.001	20
	Cosmos 773 rocket	1975-94B	1975 Sep 30.78 100 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Oct 2.5	74.06	100.77	7173	782	807	0.002	33
	Fragment	1975-94C											

* Aura, carrying solar experiments, is the final French national launch.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 774	1975-95A	1975 Oct 1.36	Sphere-cylinder	6.5 long?	1975 Oct 2.4	71.35	89.72	6638	204	315	0.008	43
R			13.86 days	6300?	2.4 dia	1975 Oct 3.9	71.35	89.63	6633	169	341	0.013	59
			1975 Oct 15.22										
D	Cosmos 774 rocket	1975-95B	1975 Oct 1.36	Cylinder	7.5 long	1975 Oct 2.0	71.37	89.59	6631	201	305	0.008	38
			9 days	2500?	2.6 dia								
			1975 Oct 10										
D	Cosmos 774 engine*	1975-95F	1975 Oct 1.36	Cone	1.5 long?	1975 Oct 11.3	71.35	89.14	6609	167	294	0.010	-
			15 days	600? full	2 dia?								
			1975 Oct 16										
D	Fragments	1975-95C-E,G											
D	Explorer 54 (AE-D)	1975-96A	1975 Oct 6.38	16-sided cylinder	1.14 long	1975 Oct 6.4	90.10	126.87	8364	155	3816	0.219	186
			158 days	659 full	1.36 dia								
			1976 Mar 12	490 empty									
D	Explorer 54 second stage	1975-96B	1975 Oct 6.38	Cylinder + annulus	6.4 long	1975 Oct 7.4	90.05	126.60	8350	146	3798	0.219	184
			178 days	350?	1.52 and 2.44 dia								
			1976 Apr 1										
	Cosmos 775	1975-97A	1975 Oct 8.02	-	-	1975 Nov 1.0	0.03	1445.9	42357	35737	36220	0.006	84**
			> million years			1976 Jan 1.0	0.1	1436.1	42164	35757	35815	0.0007	-
D	Cosmos 775 launcher	1975-97B	1975 Oct 8.02	Irregular	-	1975 Oct 8.3	51.49	88.26	6570	178	205	0.002	331
			2 days										
			1975 Oct 10										
D	Cosmos 775 launcher rocket	1975-97C	1975 Oct 8.02	Cylinder	12 long?	1975 Oct 8.3	51.48	88.26	6570	178	205	0.002	331
			1 day	4000?	4 dia								
			1975 Oct 9										

* 1975-95F ejected from 1975-95A about 1975 Oct 11.

** An apogee rocket may have separated from 1975-97A.

1975-97 continued on page 422

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 775 rocket	1975-97D	1975 Oct 8.02 875 days 1978 Mar 1	Cylinder 1900?	3.9 long? 3.9 dia	1975 Nov 1.0	47.3	631.9	24393	281	35748	0.727	-
	Fragment	1975-97E											
D	[Titan 3B Agena D]	1975-98A	1975 Oct 9.80 52 days 1975 Nov 30	Cylinder 3000?	8 long? 1.5 dia	1975 Oct 12.0	96.41	89.34	6619	125	356	0.017	146
T	Triad 2 (TIP 2)*	1975-99A	1975 Oct 12.28 40 years	Dumb-bell 94	7.3 long 0.59 dia	1975 Oct 13.4 1978 Jul 8.1	90.74 90.4	95.34 98.83	6912 7079	362 582	705 820	0.025 0.017	176 288
D	Triad 2 rocket	1975-99B	1975 Oct 12.28 898 days 1978 Mar 28	Cylinder 24	1.50 long 0.46 dia	1975 Oct 13.3	90.74	95.32	6911	360	705	0.025	176
D	Fragments	1975-99C,D											
T	GOES 1** (SMS 3)	1975-100A	1975 Oct 16.94 > million years	Cylinder + boom 627 full 243 empty	2.30 long 1.90 dia	1975 Oct 24.1	1.00	1435.9	42161	35770	35796	0.0003	137
D	GOES 1 second stage	1975-100B	1975 Oct 16.94 81 days 1976 Jan 5	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1975 Oct 22.5	28.26	95.68	6937	187	930	0.054	237
	GOES 1 third stage	1975-100C	1975 Oct 16.94 8 years?	Sphere-cone 66	1.32 dia 0.94 dia	1975 Oct 17.0	23.76	650.96	24876	200	36796	0.736	180
D	Fragments	1975-100D,E											

* Transit Improvement Program.

** Geostationary Operational Environmental Satellite. An apogee motor may have separated and be in a similar orbit.

Year of launch 1975 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 776	1975-101A	1975 Oct 17.61 11.66 days 1975 Oct 29.27	Sphere-cylinder 5900?	5.9 long 2.4 dia	1975 Oct 19.3	62.82	89.36	6622	200	288	0.007	62
D	Cosmos 776 rocket	1975-101B	1975 Oct 17.61 6 days 1975 Oct 23	Cylinder 2500?	7.5 long 2.6 dia	1975 Oct 19.7	62.82	89.02	6605	183	271	0.007	45
D	Capsule*	1975-101D	1975 Oct 17.61 15 days 1975 Nov 1	Ellipsoid 200?	0.9 long 1.9 dia	1975 Oct 27.6	62.83	89.17	6613	195	274	0.006	59
D	Fragments	1975-101C,E											
D	Cosmos 777**	1975-102A	1975 Oct 29.46 218 days 1976 Jun 3	Cylinder?	-	1975 Oct 29.5 1975 Nov 1.2	64.97 65.02	89.83 93.30	6646 6812	123 425	412 442	0.022 0.001	53 276
D	Cosmos 777 rocket	1975-102B	1975 Oct 29.46 1 day 1975 Oct 30	Cylinder 1500?	8 long? 2.5 dia?	1975 Oct 29.7	64.98	89.39	6624	118	373	0.019	56
D	Fragments	1975-102C-BQ											
	Cosmos 778	1975-103A	1975 Nov 4.42 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1975 Nov 4.7	82.96	104.95	7369	978	1004	0.002	264
	Cosmos 778 rocket	1975-103B	1975 Nov 4.42 600 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Nov 4.6	82.97	104.81	7362	973	995	0.002	243
D R	Cosmos 779	1975-104A	1975 Nov 4.64 13.64 days 1975 Nov 18.28	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1975 Nov 6.6 1975 Nov 9.6	62.80 62.80	89.71 89.25	6640 6617	182 170	341 307	0.012 0.010	70 65

* 1975-101D ejected from 1975-101A about 1975 Oct 27.

** Cosmos 777 partially disintegrated in late January 1976.

1975-104 continued on page 424

Year of launch 1975 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 779 rocket	1975-104B	1975 Nov 4.64 6 days 1975 Nov 10	Cylinder 2500?	7.5 long 2.6 dia	1975 Nov 6.5	62.79	89.11	6610	172	291	0.009	65
D	Cosmos 779 engine*	1975-104C	1975 Nov 4.64 15 days 1975 Nov 19	Cone 600? full	1.5 long? 2 dia?	1975 Nov 16.1	62.80	88.95	6602	163	284	0.009	58
D	Fragment	1975-104D											
	Molniya 3C	1975-105A	1975 Nov 14.80 100 years?	Windmill + 6 vanes 1500?	4.2 long? 1.6 dia	1975 Nov 16.4 1975 Nov 24.9	62.90 62.80	737.26 717.21	27035 26542	523 483	40790 39844	0.745 0.742	281 280
D	Molniya 3C launcher rocket	1975-105B	1975 Nov 14.80 31 days 1975 Dec 15	Cylinder 2500?	7.5 long 2.6 dia	1975 Nov 16.4	62.78	90.92	6699	212	429	0.016	126
D	Molniya 3C launcher	1975-105C	1975 Nov 14.80 21 days 1975 Dec 5	Irregular	-	1975 Nov 16.4	62.79	90.93	6699	191	451	0.019	117
	Molniya 3C rocket	1975-105D	1975 Nov 14.80 100 years?	Cylinder 440	2.0 long 2.0 dia	1975 Dec 4.2	62.79	733.57	26940	492	40630	0.745	280
D	Soyuz 20**	1975-106A	1975 Nov 17.61	Sphere-cylinder 6570?	7.5 long 2.3 dia	1975 Nov 17.8	51.62	88.72	6592	177	251	0.006	133
B			90.5 days			1975 Nov 18.4	51.62	89.74	6643	247	282	0.003	261
R			1976 Feb 16.1			1975 Nov 20.2	51.59	91.39	6724	342	350	0.001	59
D	Soyuz 20 rocket	1975-106B	1975 Nov 17.61 3 days 1975 Nov 20	Cylinder 2500?	7.5 long 2.6 dia	1975 Nov 18.5	51.62	88.53	6583	185	224	0.003	89

* 1975-104C ejected from 1975-104A about 1975 Nov 15.

** Soyuz 20 (unmanned) docked with Salyut 4 about 1975 Nov 19.68.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Explorer 55 (AE-E)	1975-107A	1975 Nov 20.09 6 years	16-sided cylinder 720 full 490 empty	1.14 long 1.36 dia	1975 Nov 25.0 1976 Nov 23.0	19.70 19.66	117.29 89.82	7948 6644	156 264	2983 267	0.178 0.0002	229 28
D	Explorer 55 second stage	1975-107B	1975 Nov 20.09 120 days 1976 Mar 19	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1975 Nov 21.5	19.67	117.32	7949	157	2985	0.178	200
D R	Cosmos 780	1975-108A	1975 Nov 21.39 11.85 days 1975 Dec 3.24	Sphere-cylinder 5900?	5.9 long 2.4 dia	1975 Nov 24.2	65.01	89.28	6618	201	278	0.006	44
D	Cosmos 780 rocket	1975-108B	1975 Nov 21.39 6 days 1975 Nov 27	Cylinder 2500?	7.5 long 2.6 dia	1975 Nov 23.4	65.01	89.03	6605	199	255	0.004	36
D	Capsule*	1975-108D	1975 Nov 21.39 20 days 1975 Dec 11	Ellipsoid 200?	0.9 long 1.9 dia	1975 Dec 3.5	65.01	89.14	6611	197	268	0.005	-
D	Fragments	1975-108C,E											
	Cosmos 781	1975-109A	1975 Nov 21.72 10 years	Cylinder + paddles 900?	2 long? 1 dia?	1975 Nov 22.0	74.03	95.21	6906	505	551	0.003	353
	Cosmos 781 rocket	1975-109B	1975 Nov 21.72 10 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Nov 23.0	74.04	95.11	6901	497	549	0.004	354
7d	Fragments	1975-109C-L											
D B R	Cosmos 782	1975-110A	1975 Nov 25.71 19.5 days 1975 Dec 15.2	Sphere-, cylinder 5900?	5.9 long 2.4 dia	1975 Nov 27.2	62.81	90.52	6679	218	384	0.012	108
D	Cosmos 782 rocket	1975-110B	1975 Nov 25.71 28 days 1975 Dec 23	Cylinder 2500?	7.5 long 2.6 dia	1975 Nov 27.2	62.80	90.39	6673	217	372	0.012	103

1975-110 continued on page 426

* 1975-108D ejected from 1975-108A on 1975 Dec 2.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Capsule*	1975-110D	1975 Nov 25.71 77 days 1976 Feb 10	Ellipsoid 200?	0.9 long 1.9 dia	1975 Dec 15.7	62.80	90.35	6671	216	369	0.011	112
D	Fragments	1975-110C,E											
D r	China 4 †	1975-111A	1975 Nov 26.15 33 days 1975 Dec 29	- 3500?	-	1975 Nov 28.0	62.95	91.09	6707	179	479	0.022	147
D	China 4 rocket	1975-111B	1975 Nov 26.15 26 days 1975 Dec 22	Cylinder	-	1975 Nov 28.0	62.95	90.94	6700	177	466	0.022	147
D	Fragments	1975-111C-F											
	Cosmos 783	1975-112A	1975 Nov 28.01 120 years	Cylinder + paddles? 750?	2 long? 1 dia?	1975 Nov 29.9	74.06	100.99	7183	795	815	0.001	46
	Cosmos 783 rocket	1975-112B	1975 Nov 28.01 100 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Nov 29.9	74.06	100.89	7178	785	815	0.002	47
	Fragment	1975-112C											
D R	Cosmos 784	1975-113A	1975 Dec 3.42 11.85 days 1975 Dec 15.27	Sphere-cylinder 5900?	5.9 long 2.4 dia	1975 Dec 3.7	81.33	88.99	6602	215	232	0.001	14
D	Cosmos 784 rocket	1975-113B	1975 Dec 3.42 4 days 1975 Dec 7	Cylinder 2500?	7.5 long 2.6 dia	1975 Dec 4.1	81.33	88.86	6595	213	221	0.001	325
D	Capsule**	1975-113G	1975 Dec 3.42 18 days 1975 Dec 21	Ellipsoid 200?	0.9 long 1.9 dia	1975 Dec 14.6	81.32	88.72	6588	203	217	0.001	320
D	Fragments	1975-113C-F											

* 1975-110D ejected from 1975-110A about 1975 Dec 15

** 1975-113G ejected from 1975-113A about 1975 Dec 14

† Capsule recovered on 1975 Dec 2

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Titan 3D]	1975-114A	1975 Dec 4.86 119 days 1976 Apr 1	Cylinder 13300? full	15 long 3.0 dia	1975 Dec 6.5	96.27	88.44	6574	157	234	0.006	132
D	Capsule	1975-114B	1975 Dec 4.86 879 days 1978 May 1	-	-	1975 Dec 8.1	96.28	102.95	7275	236	1558	0.091	305
D	Titan 3D rocket	1975-114C	1975 Dec 4.86 2 days 1975 Dec 6	Cylinder 1900	6 long 3.0 dia	1975 Dec 5.4	96.27	88.12	6558	156	203	0.004	126
D	Fragment	1975-114D											
	Intercosmos 14	1975-115A	1975 Dec 11.71 10 years	Octagonal ellipsoid 550?	1.8 long? 1.5 dia?	1975 Dec 14.9	73.99	105.33	7388	335	1684	0.091	64
	Intercosmos 14 rocket	1975-115B	1975 Dec 11.71 10 years	Cylinder 2200?	7.4 long 2.4 dia	1975 Dec 14.9	74.01	105.16	7379	325	1677	0.092	63
2d	Fragments	1975-115C-F											
	Cosmos 785*	1975-116A	1975 Dec 12.53 600 years	Cone-cylinder	6 long? 2 dia?	1975 Dec 12.6 1975 Dec 15.2	64.96 65.07	89.61 104.26	6634 7339	251 898	261 1023	0.001 0.009	331 202
D	Cosmos 785 rocket	1975-116B	1975 Dec 12.53 2 days 1975 Dec 14	Cylinder 1500?	8 long? 2.5 dia?	1975 Dec 13.2	65.00	89.73	6640	241	283	0.003	-
D	Cosmos 785 platform	1975-116C	1975 Dec 12.53 55 days 1976 Feb 5	Irregular	-	1975 Dec 15.1	64.99	89.57	6632	248	260	0.001	270

* 1975-116B and 116C attached to 1975-116A until orbit change about 1975 Dec 13.21.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	RCA Satcom 1*	1975-117A	1975 Dec 13.08 > million years	Box + 2 panels 868 full 463 empty	1.62 high 1.25 wide 1.25 deep	1975 Dec 13.1 1976 Jan 1.0 1976 Mar 31.0	27.2 0.3 0.0	634.8 1439.7 1436.2	24467 42234 42165	185 35625 35783	35993 36086 35790	0.732 0.005 0.0001	- - -
D	RCA Satcom 1 second stage	1975-117B	1975 Dec 13.08 237 days 1976 Aug 7	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1976 Jan 6.0	28.40	105.76	7413	190	1880	0.114	21
	RCA Satcom 1 third stage	1975-117C	1975 Dec 13.08 5 years	Sphere-cone 66	1.32 long 0.94 dia	1975 Dec 13.1 1977 Jan 1.0	27.2 26.6	634.8 615.9	24467 23978	185 282	35993 34917	0.732 0.722	-
T	IMEWS 5 [Titan 3C]	1975-118A	1975 Dec 14.22 > million years	Cylinder +4 panels 820?	6 long? 2.5 dia?	1975 Dec 14.6 1976 Jan 1.0	26.3 3.0	633.0 1436	24445 42106	295 35671	35840 35785	0.727 0.001	180 ** -
D	Titan 3C second stage	1975-118B	1975 Dec 14.22 5 days 1975 Dec 19	Cylinder 1900	6 long 3.0 dia	1975 Dec 14.4	28.60	89.86	6653	151	398	0.019	115
	Transtage	1975-118C	1975 Dec 14.22 > million years	Cylinder 1500?	6 long? 3.0 dia	Orbits similar to 1975-118A							
	Fragment	1975-118D											
D	China 5	1975-119A	1975 Dec 16.39 42 days 1976 Jan 27	- 3500?	-	1975 Dec 17.7	69.00	90.26	6665	186	387	0.015	142
D	China 5 rocket	1975-119B	1975 Dec 16.39 25 days 1976 Jan 10	Cylinder	-	1975 Dec 17.8	69.00	90.18	6661	185	380	0.015	142

* RCA is Radio Corporation of America.

** Approximate orbit

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 786	1975-120A	1975 Dec 16.41	Sphere-cylinder	6.5 long?	1975 Dec 17.7	65.00	89.49	6628	174	326	0.011	60
R			12.81 days	6300?	2.4 dia	1975 Dec 24.4	65.00	89.23	6615	172	302	0.010	59
			1975 Dec 29.22										
D	Cosmos 786 rocket	1975-120B	1975 Dec 16.41	Cylinder	7.5 long	1975 Dec 17.1	65.01	89.35	6621	174	312	0.010	60
			5 days	2500?	2.6 dia								
			1975 Dec 21										
D	Cosmos 786 engine*	1975-120C	1975 Dec 16.41	Cone	1.5 long?	1976 Jan 1.6	65.00	88.45	6577	163	234	0.005	-
			18 days	600? full	2 dia?								
			1976 Jan 3										
D	Fragments	1975-120D,E											
	Molniya 2Q	1975-121A	1975 Dec 17.47	Windmill	4.2 long?	1975 Dec 18.5	62.81	736.01	27004	431	40821	0.748	280
			$9\frac{1}{2}$ years	+6 vanes	1.6 dia	1975 Dec 25.6	62.86	717.99	26562	436	39931	0.744	281
				1250?									
D	Molniya 2Q launcher rocket	1975-121B	1975 Dec 17.47	Cylinder	7.5 long	1975 Dec 19.1	62.82	90.51	6679	211	390	0.013	134
			28 days	2500?	2.6 dia								
			1976 Jan 14										
D	Molniya 2Q launcher	1975-121C	1975 Dec 17.47	Irregular	-	1975 Dec 19.1	62.82	90.80	6693	196	433	0.018	125
			25 days										
			1976 Jan 11										
	Molniya 2Q rocket	1975-121D	1975 Dec 17.47	Cylinder	2.0 long	1976 Mar 1.0	62.81	732.38	26915	478	40596	0.745	-
			$9\frac{1}{2}$ years	440	2.0 dia								

* 1975-120C ejected from 1975-120A on 1975 Dec 29

Year of launch 1975 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Prognoz 4	1975-122A	1975 Dec 22.09 10 years?	Spheroid + 4 vanes 905	1.8 dia?	1975 Dec 22.1 1975 Dec 23.0	65.04 65.0	91.50 5740	6727 106195	232 634	465 199000	0.017 0.934	66 -
D	Prognoz 4 launcher rocket	1975-122B	1975 Dec 22.09 62 days 1976 Feb 22	Cylinder 2500?	7.5 long 2.6 dia	1975 Dec 23.5	64.98	91.50	6727	229	468	0.018	68
D	Prognoz 4 launcher	1975-122C	1975 Dec 22.09 49 days 1976 Feb 9	Irregular	-	1975 Dec 23.5	65.02	91.60	6732	209	498	0.021	66
	Prognoz 4 rocket	1975-122D	1975 Dec 22.09 10 years?	Cylinder 440	2.0 long 2.0 dia	Orbit similar to 1975-122A							
	Statsionar - Raduga 1**	1975-123A	1975 Dec 22.55 >million years	-	-	1975 Dec 23.0	0.1	1434	42178	35800	35800	0	-*
D	Raduga 1 launcher	1975-123B	1975 Dec 22.55 <0.5 day 1975 Dec 22	Irregular	-	1975 Dec 22.7	51.46	87.88	6550	146	197	0.004	151
D	Raduga 1 launcher rocket	1975-123C	1975 Dec 22.55 3 days 1975 Dec 25	Cylinder 4000?	12 long? 4 dia	1975 Dec 22.8	51.49	88.22	6567	182	195	0.001	309
	Raduga 1 rocket	1975-123D	1975 Dec 22.55 6 years?	Cylinder 1900?	3.9 long? 3.9 dia	1976 Jan 18.3	47.14	630.35	24353	257	35694	0.728	7
	Fragment	1975-123E											

* Approximate orbit. There may be a separated apogee motor in a similar orbit.

** Raduga means Rainbow

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Meteor 23	1975-124A	1975 Dec 25.79 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1975 Dec 28.6	81.26	102.42	7250	842	902	0.004	287
	Meteor 23 rocket	1975-124B	1975 Dec 25.79 400 years	Cylinder 1440	3.8 long 2.6 dia	1975 Dec 27.1	81.26	102.49	7254	842	909	0.005	215
	Molniya 3D	1975-125A	1975 Dec 27.44 10½ years	Windmill + 6 vanes 1500?	4.2 long? 1.6 dia	1975 Dec 30.5 1976 Mar 1.0	62.81 62.9	735.10 717.69	26982 26554	443 507	40764 39845	0.747 0.741	280 -
D	Molniya 3D launcher rocket	1975-125B	1975 Dec 27.44 27 days 1976 Jan 23	Cylinder 2500?	7.5 long 2.6 dia	1975 Dec 28.6	62.77	90.78	6692	208	419	0.016	130
D	Molniya 3D launcher	1975-125C	1975 Dec 27.44 23 days 1976 Jan 19	Irregular	-	1975 Dec 28.6	62.83	90.94	6700	194	449	0.019	123
	Molniya 3D rocket	1975-125F	1975 Dec 27.44 10½ years	Cylinder 440	2.0 long 2.0 dia	1976 Jan 26.4	62.80	731.17	26886	453	40562	0.746	280
D	Fragments	1975-125D,E											

Year of launch 1976

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 787	1976-01A	1976 Jan 6.21 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1976 Jan 7.6	74.03	95.30	6911	518	547	0.002	16
	Cosmos 787 rocket	1976-01B	1976 Jan 6.21 10 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Jan 15.4	74.04	95.19	6905	507	547	0.003	3
D	Fragments	1976-01C -K											
D	Cosmos 788	1976-02A	1976 Jan 7.65	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1976 Jan 8.4	62.81	89.53	6630	183	321	0.010	77
R			12.60 days 1976 Jan 20.25			1976 Jan 9.8	62.81	89.35	6621	169	317	0.011	73
D	Cosmos 788 rocket	1976-02B	1976 Jan 7.65 7 days 1976 Jan 14	Cylinder 2500?	7.5 long 2.6 dia	1976 Jan 8.4	62.79	89.42	6625	180	313	0.010	75
D	Cosmos 788 engine*	1976-02D	1976 Jan 7.65 20 days 1976 Jan 27	Cone 600? full	1.5 long? 2 dia?	1976 Jan 20.4	62.81	89.45	6626	166	330	0.012	-
D	Fragments	1976-02C,E,F											
T	CTS 1**	1976-04A	1976 Jan 17.98 >million years	Cylinder + 2 wings 680 full?	1.88 long 1.83 dia 16.8 span	1976 Jan 20.0 1976 Jan 26.8 1976 Mar 1.0	27.29 0.67 0.55	635.88 1442.2 1436.1	24491 42285 42165	205 35786 35774	36021 36028 35800	0.731 0.003 0.0003	180 213 -
D	CTS 1 second stage	1976-04B	1976 Jan 17.98 28 days 1976 Feb 14	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1976 Feb 11.0	28.66	89.02	6612	162	306	0.011	92

Space Vehicle: Helios 2, 1976-03A; Helios 2 rocket, 1976-03C; Helios 2 second stage, 1976-03B. * Jettisoned about 1976 Jan 19.
** Canadian Communications Technology Satellite, launched by NASA.

1976-04 continued on page 433

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	CTS 1 third stage	1976-04D	1976 Jan 17.98 486 days 1977 May 17	Sphere-cone 66	1.32 long 0.94 dia	1976 Jan 21.3	27.18	637.64	24548	180	36160	0.733	181
D	Fragment	1976-04C											
	Cosmos 789	1976-05A	1976 Jan 20.71 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1976 Jan 24.8	82.97	105.05	7374	975	1016	0.003	263
	Cosmos 789 rocket	1976-05B	1976 Jan 20.71 600 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Jan 21.5	82.97	104.94	7368	974	1006	0.002	259
	Molniya 1AH	1976-06A	1976 Jan 22.49 100 years?	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1976 Jan 22.6 1976 Jan 27.4 1976 Feb 5.8	62.98 62.94 62.91	91.83 698.38 717.74	6743 26074 26556	233 465 476	497 38927 39879	0.020 0.738 0.742	63 280 280
D	Molniya 1AH launcher rocket	1976-06B	1976 Jan 22.49 71 days 1976 Apr 2	Cylinder 2500?	7.5 long 2.6 dia	1976 Jan 23.5	62.99	91.75	6739	234	488	0.019	61
D	Molniya 1AH launcher	1976-06C	1976 Jan 22.49 88 days 1976 Apr 19	Irregular	-	1976 Jan 23.5	62.98	91.86	6745	240	493	0.019	65
	Molniya 1AH rocket	1976-06D	1976 Jan 22.49 100 years?	Cylinder 440	2.0 long 2.0 dia	1976 Feb 17.1	62.96	695.47	26001	497	38749	0.735	280

Year of launch 1976 continued

Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
Cosmos 790	1976-07A	1976 Jan 22.94 10 years	Cylinder + paddles 900?	2 long? 1 dia?	1976 Jan 25.2	74.04	95.25	6908	511	549	0.003	353
Cosmos 790 rocket	1976-07B	1976 Jan 22.94 10 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Jan 23.2	74.05	95.12	6902	499	548	0.004	3
Cosmos 791	1976-08A	1976 Jan 28.44 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jan 28.7	74.05	114.81	7824	1402	1490	0.006	112
Cosmos 792	1976-08B	1976 Jan 28.44 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jan 28.7	74.06	115.23	7843	1436	1494	0.004	133
Cosmos 793	1976-08C	1976 Jan 28.44 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jan 28.7	74.06	115.02	7834	1418	1494	0.005	128
Cosmos 794	1976-08D	1976 Jan 28.44 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jan 28.9	74.06	115.44	7853	1452	1497	0.003	148
Cosmos 795	1976-08E	1976 Jan 28.44 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jan 28.9	74.05	115.66	7863	1467	1503	0.002	175
Cosmos 796	1976-08F	1976 Jan 28.44 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jan 28.9	74.04	115.90	7874	1474	1518	0.003	202
Cosmos 797	1976-08G	1976 Jan 28.44 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jan 28.9	74.05	116.13	7885	1480	1533	0.003	230

1976-08 continued on page 435

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 798	1976-08H	1976 Jan 28.44 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jan 28.9	74.05	116.40	7897	1481	1557	0.005	239
	Cosmos 791 rocket	1976-08J	1976 Jan 28.44 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Feb 1.7	74.06	118.03	7970	1486	1698	0.013	259
D R	Cosmos 799	1976-09A	1976 Jan 29.36 11.8 days 1976 Feb 10.2	Sphere-cylinder 5700?	5.0 long 2.4 dia	1976 Jan 30.5	71.40	89.64	6634	205	306	0.008	47
D	Cosmos 799 rocket	1976-09B	1976 Jan 29.36 13 days 1976 Feb 11	Cylinder 2500?	7.5 long 2.6 dia	1976 Jan 29.8	71.41	89.58	6631	208	297	0.007	47
D	Fragments	1976-09C,D											
T	Intelsat 4A (F-2)	1976-10A	1976 Jan 30.00 > million years	Cylinder 1500 full 795 empty	2.82 long 2.39 dia	1976 Feb 1.0 1976 May 1.0	0.1 0.1	1420.2 1436.2	41855 42167	35084 35784	35869 35794	0.009 0.0001	- -
	Intelsat 4A (F-2) rocket	1976-10B	1976 Jan 30.00 6000 years	Cylinder 1815	8.6 long 3.0 dia	1976 May 1.0	21.5	655.0	24984	605	36606	0.721	-
	Cosmos 800	1976-11A	1976 Feb 3.34 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1976 Feb 4.9	82.97	105.13	7378	984	1015	0.002	275
	Cosmos 800 rocket	1976-11B	1976 Feb 3.34 600 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Feb 3.5	82.98	105.00	7371	983	1003	0.001	250

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 801	1976-12A	1976 Feb 5.61 700 days 1978 Jan 5	Ellipsoid 400?	1.8 long. 1.2 dia.	1976 Feb 13.3	70.98	95.28	6910	268	796	0.038	72
D	Cosmos 801 rocket	1976-12B	1976 Feb 5.61 413 days 1977 Mar 24	Cylinder 1500?	8 long 1.65 dia	1976 Feb 9.6	71.03	95.20	6906	283	773	0.036	78
D	Fragments	1976-12C-S											
D	Cosmos 802	1976-13A	1976 Feb 11.37	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1976 Feb 13.0	64.99	89.56	6631	172	334	0.012	62
R			13.84 days 1976 Feb 25.21			1976 Feb 13.7	64.98	89.33	6620	173	311	0.010	63
D	Cosmos 802 rocket	1976-13B	1976 Feb 11.37 6 days 1976 Feb 17	Cylinder 2500?	7.5 long 2.6 dia	1976 Feb 12.4	64.98	89.35	6621	170	316	0.011	58
D	Cosmos 802 engine*	1976-13D	1976 Feb 11.37 18 days 1976 Feb 29	Cone 600? full	1.5 long? 2 dia?	1976 Feb 22.7	64.98	89.25	6616	170	306	0.010	57
D	Fragments	1976-13C,E											
	Cosmos 803	1976-14A	1976 Feb 12.54 40 years	Cylinder?	4 long? 2 dia?	1976 Feb 15.3	65.85	96.39	6964	554	618	0.005	2
	Cosmos 803 rocket	1976-14B	1976 Feb 12.54 30 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Feb 15.5	65.86	96.31	6960	546	618	0.005	5
	Fragment	1976-14C											
D	Cosmos 804**	1976-15A	1976 Feb 16.35 0.4 days? 1976 Feb 16.7?	Cylinder?	4 long? 2 dia?	1976 Feb 16.4 1976 Feb 16.7	65.15 65.86	93.08 96.38	6804 6964	149 556	703 615	0.041 0.004	55 3

* Jettisoned from 1976-13A about 1976 Feb 22.

** Cosmos 804 passed close to Cosmos 803 between 1976 Feb 16.41 and 16.68; then retrofired, with descent into Pacific Ocean?

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 804 rocket	1976-15B	1976 Feb 16.35 10 days 1976 Feb 26	Cylinder 1500?	8 long? 2.5 dia?	1976 Feb 17.7	65.12	92.36	6769	142	640	0.037	52
D	[Thor Burner 2]	1976-16A	1976 Feb 19.33 <0.67 day 1976 Feb 19	Cone-cylinder? 1355 full?	2.96 long? 0.94 to 1.31 dia?	1976 Feb 19.4	98.87	88.97	6601	90	355	0.020	328
T	Marisat 1	1976-17A	1976 Feb 19.94 >million years	Cylinder 655 full. 362 empty	2.4 long? 1.9 dia?	1976 Feb 25.7	2.4	1436.1	42163	35703	35867	0.002	-
D	Marisat 1 second stage	1976-17B	1976 Feb 19.94 26 days 1976 Mar 16	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1976 Feb 29.2	28.59	91.38	6729	175	527	0.026	219
	Marisat 1 third stage	1976-17C	1976 Feb 19.94 4½ years	Sphere-cone 66	1.32 long 0.94 dia	1976 Mar 1.0 1977 Mar 1.0	25.99 25.1	651.4 624.0	24895 24189	182 310	36851 35311	0.737 0.724	- -
	Marisat 1 apogee motor	1976-17F	1976 Feb 19.94 >million years	- 293 full	-	Orbit similar to 1976-17A							
D	Fragments	1976-17D,E											
D	Cosmos 805*	1976-18A	1976 Feb 20.59 19.6 days 1976 Mar 11.2	Sphere-cylinder 6700?	7 long? 2.4 dia	1976 Feb 20.8 1976 Mar 6.8	67.13 67.13	89.72 89.61	6639 6634	171 168	351 343	0.014 0.013	80 55
D	Cosmos 805 rocket	1976-18B	1976 Feb 20.59 7 days 1976 Feb 27	Cylinder 2500?	7.5 long 2.6 dia	1976 Feb 24.1	67.13	89.00	6603	165	284	0.009	67
D	Fragment	1976-18C											

* No jettisoned engine was apparently tracked or designated.

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Ume (ISS 1)* [Nu]	1976-19A	1976 Feb 29.15 1200 years	Cylinder 85	0.82 long 0.94 dia	1976 Mar 15.5	69.67	105.20	7382	994	1013	0.001	215
	Ume rocket	1976-19B	1976 Feb 29.15 600 years	Cylinder?	-	1976 Mar 15.5	69.68	105.22	7383	994	1015	0.001	207
D	Cosmos 806	1976-20A	1976 Mar 10.34	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1976 Mar 11.4	71.37	89.65	6634	178	334	0.012	41
R			12.89 days 1976 Mar 23.23			1976 Mar 21.3	71.37	89.82	6643	177	352	0.013	20
D	Cosmos 806 rocket	1976-20B	1976 Mar 10.34 5 days 1976 Mar 15	Cylinder 2500?	7.5 long 2.6 dia	1976 Mar 11.3	71.37	89.39	6621	174	312	0.010	35
D	Cosmos 806 engine**	1976-20C	1976 Mar 10.34 20 days 1976 Mar 30	Cone 600? full	1.5 long? 2 dia?	1976 Mar 22.6	71.37	89.71	6637	173	345	0.013	17
D	Fragments	1976-20D,E											
	Molniya 1AJ	1976-21A	1976 Mar 11.83	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1976 Mar 14.9	62.84	734.41	26965	491	40682	0.745	280
			100 years?			1976 Mar 24.0	62.86	717.93	26560	487	39877	0.742	280
D	Molniya 1AJ launcher	1976-21B	1976 Mar 11.83 33 days 1976 Apr 13	Irregular	-	1976 Mar 12.8	62.85	91.44	6724	203	488	0.021	129
D	Molniya 1AJ launcher rocket	1976-21C	1976 Mar 11.83 25 days 1976 Apr 5	Cylinder 2500?	7.5 long 2.6 dia	1976 Mar 13.9	62.83	91.41	6722	192	496	0.023	124
	Molniya 1AJ rocket	1976-21D	1976 Mar 11.83 100 years?	Cylinder 440	2.0 long 2.0 dia	1976 Sep 19.3	63.13	731.14	26884	451	40560	0.746	281

* Japanese Ionospheric Sounding Satellite.

** Jettisoned from 1976-20A about 1976 Mar 22.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 807	1976-22A	1976 Mar 12.56 35 years	-	-	1976 Mar 17.6	82.97	109.13	7564	398	1973	0.104	117
	Cosmos 807 rocket	1976-22B	1976 Mar 12.56 30 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Mar 20.3	82.97	109.00	7558	391	1968	0.104	109
T	LES 8	1976-23A	1976 Mar 15.06 >million years	Cylinder + box 454	3.0 long 1.6 dia?	1976 Apr 1.0	25.0	1436.1	42165	35787	35787	0	-*
T	LES 9	1976-23B	1976 Mar 15.06 >million years	Cylinder + box 454	3.0 long 1.6 dia?	1976 Apr 1.0	25.0	1436.1	42165	35787	35787	0	-*
T	Solrad 11A	1976-23C	1976 Mar 15.06 >million years	Annulus + 4 vanes 181	0.41 deep 0.61 inner 1.47 outer diameter	1976 Jul 1.0	25.7	7344.3	125160	118383	119180	0.003	-
T	Solrad 11B	1976-23D	1976 Mar 15.06 >million years	Annulus + 4 vanes 181	size same as 1976-23C	1976 Jul 1.0	25.6	7116.7	122560	115720	116645	0.004	-
D	Titan 3C second stage	1976-23E	1976 Mar 15.06 < 1 day 1976 Mar 15	Cylinder 1900	6 long 3.0 dia	1976 Mar 15.2	28.60	87.42	6532	148	160	0.001	130
	Transtage	1976-23F	1976 Mar 15.06 >million years	Cylinder 1500?	6 long? 3.0 dia		Orbit similar to 1976-23A						
	Fragments**	1976-23G-J											

* Approximate orbits

** Two of these objects are probably Solrad apogee motors.

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 808	1976-24A	1976 Mar 16.73 60 years	Cylinder + 2 vanes? 2500?	5 long? 1.5 dia?	1976 Mar 24.8	81.25	97.10	6996	602	634	0.002	247
	Cosmos 808 rocket	1976-24B	1976 Mar 16.73 60 years	Cylinder 1440	3.8 long 2.6 dia	1976 Mar 22.6	81.26	97.18	7000	563	681	0.008	182
D R	Cosmos 809	1976-25A	1976 Mar 18.39 11.88 days 1976 Mar 30.27	Sphere-cylinder 5700?	5.0 long 2.4 dia	1976 Mar 19.4	65.03	89.55	6631	205	300	0.007	61
D	Cosmos 809 rocket	1976-25B	1976 Mar 18.39 8 days 1976 Mar 26	Cylinder 2500?	7.5 long 2.6 dia	1976 Mar 20.2	65.03	89.26	6617	196	281	0.006	47
D	Fragments	1976-25C,D											
	Molniya 1AK	1976-26A	1976 Mar 19.82 8¾ years	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1976 Mar 23.3 1976 Mar 29.2	62.93 62.73	696.52 717.38	26027 26548	416 617	38882 39722	0.739 0.737	280 280
D	Molniya 1AK launcher rocket	1976-26B	1976 Mar 19.82 39 days 1976 Apr 27	Cylinder 2500?	7.5 long 2.6 dia	1976 Mar 20.4	63.01	91.03	6704	231	4[illegible]	0.014	52
D	Molniya 1AK launcher	1976-26C	1976 Mar 19.82 49 days 1976 May 7	Irregular	-	1976 Mar 20.2	63.01	91.76	6740	220	503	0.021	64
D	Molniya 1AK rocket	1976-26D	1976 Mar 19.82 744 days 1978 Apr 2	Cylinder 440	2.0 long 2.0 dia	1976 Apr 4.4	63.01	696.66	26031	494	38812	0.736	280

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Titan 3B Agena D]	1976-27A	1976 Mar 22.76 57 days 1976 May 18	Cylinder 3000?	8 long? 1.5 dia	1976 Mar 24.7	96.40	89.25	6614	125	347	0.017	136
D	Cosmos 810	1976-28A	1976 Mar 26.63 12.7 days	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1976 Mar 27.4	62.82	89.67	6637	181	338	0.012	74
R			1976 Apr 8.3			1976 Mar 28.5	62.81	89.36	6622	169	318	0.011	66
D	Cosmos 810 rocket	1976-28B	1976 Mar 26.63 6 days 1976 Apr 1	Cylinder 2500?	7.5 long 2.6 dia	1976 Mar 27.2	62.80	89.49	6628	179	321	0.011	73
D	Cosmos 810 engine*	1976-28D	1976 Mar 26.63 15 days 1976 Apr 10	Cone 600? full	1.5 long? 2 dia?	1976 Apr 7.0	62.81	89.02	6605	166	288	0.009	67
D	Fragments	1976-28C,E											
T	RCA Satcom 2	1976-29A	1976 Mar 26.95 >million years	Box + vanes 868 full 463 empty	1.62 high 1.25 wide 1.25 deep	1976 Jul 1.0	0.0	1436.2	42166	35759	35817	0.0007	-
D	RCA Satcom 2 second stage	1976-29B	1976 Mar 26.95 251 days 1976 Dec ?	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1976 Mar 28.4	28.40	106.67	7457	191	1966	0.119	187
D	RCA Satcom 2 third stage	1976-29C	1976 Mar 26.95 824 days 1978 Jun 28	Sphere-cone 66	1.32 long 0.94 dia	1976 Mar 27.0	27.2	635.6	24487	185	36032	0.732	-
D	Cosmos 811	1976-30A	1976 Mar 31.54 11.8 days	Sphere-cylinder 5900?	5.9 long 2.4 dia	1976 Apr 1.3	72.85	89.95	6650	206	338	0.010	61
R			1976 Apr 12.3										

*Jettisoned from 1976-28A about 1976 Apr 6

1976-30 continued on page 442

AD-A084 193 ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND) F/G 22/2
TABLE OF EARTH SATELLITES. VOLUMES 3. 1974 TO 1978.(U)
JAN 80 J A PILKINGTON, D G KING-HELE
UNCLASSIFIED RAE-TR-80001 DRIC -BR-72771 NL

2 OF 3
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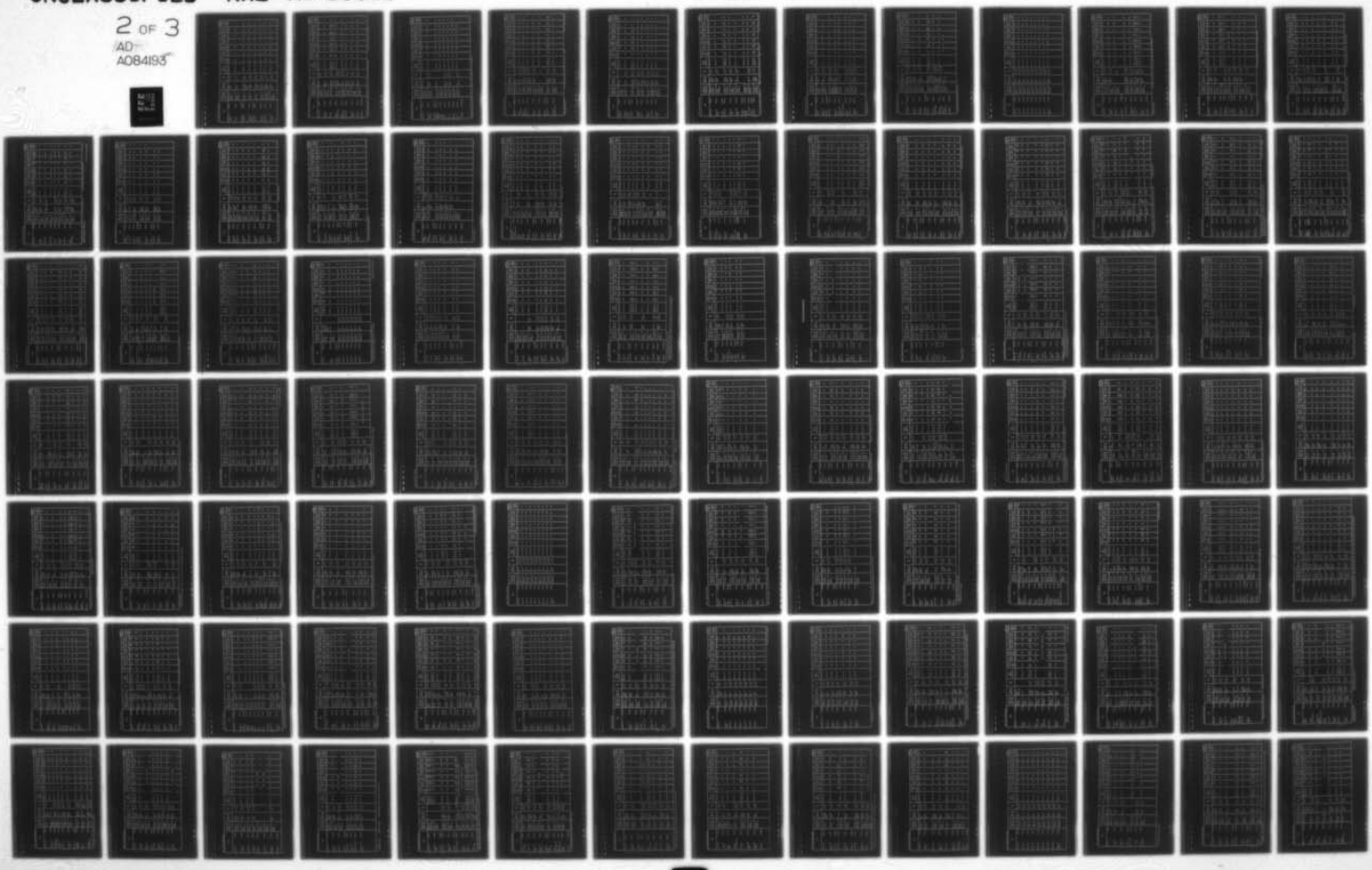

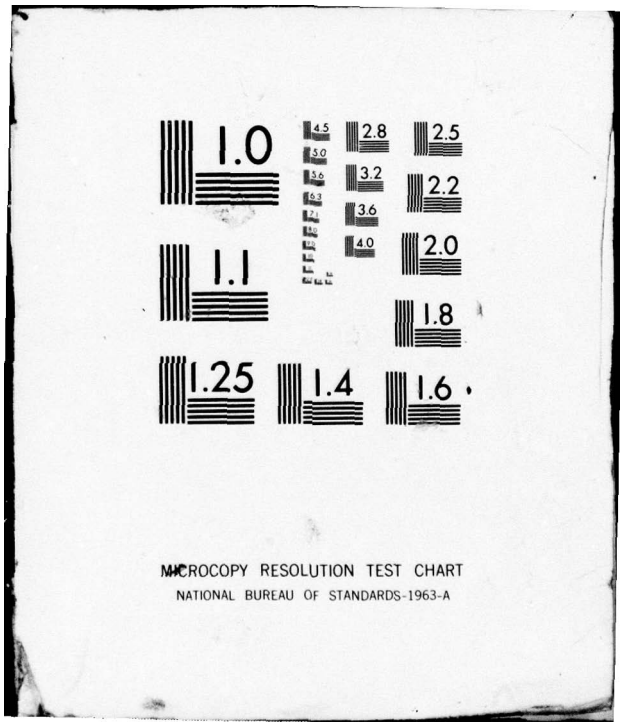

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 811 rocket	1976-30B	1976 Mar 31.54 10 days 1976 Apr 10	Cylinder 2500?	7.5 long 2.6 dia	1976 Apr 1.3	72.85	89.80	6643	206	323	0.009	56
D	Capsule	1976-30E	1976 Mar 31.54 15 days 1976 Apr 15	Ellipsoid 200?	0.9 long 1.9 dia	1976 Apr 12.3	72.85	89.70	6638	201	318	0.009	-
D	Fragments	1976-30C,D,F											
	Cosmos 812	1976-31A	1976 Apr 6.18 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1976 Apr 12.5	74.03	95.21	6906	508	548	0.003	332
	Cosmos 812 rocket	1976-31B	1976 Apr 6.18 10 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Apr 22.3	74.03	95.10	6901	499	546	0.003	332
D	Fragments	1976-31C,D											
	Meteor 24	1976-32A	1976 Apr 7.55 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1976 Apr 21.6	81.26	102.33	7246	843	893	0.003	233
	Meteor 24 rocket	1976-32B	1976 Apr 7.55 400 years	Cylinder 1440	3.8 long 2.6 dia	1976 Apr 20.6	81.26	102.43	7251	827	918	0.006	172
D R	Cosmos 813	1976-33A	1976 Apr 9.36 11.85 days 1976 Apr 21.21	Sphere-cylinder 5700?	5.0 long 2.4 dia	1976 Apr 9.7	81.34	88.98	6601	210	236	0.002	358
D	Cosmos 813 rocket	1976-33B	1976 Apr 9.36 5 days 1976 Apr 14	Cylinder 2500?	7.5 long 2.6 dia	1976 Apr 9.7	81.34	88.93	6598	206	234	0.002	352

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 814*	1976-34A	1976 Apr 13.72 <0.28 day 1976 Apr 13	Cylinder?	4 long? 2 dia?	1976 Apr 13.7	65.07	90.48	6677	118	480	0.027	41
D	Cosmos 814 rocket	1976-34B	1976 Apr 13.72 3 days 1976 Apr 16	Cylinder 1500?	8 long? 2.5 dia?	1976 Apr 13.8	65.11	90.40	6673	141	449	0.023	46
T	NATO 3A	1976-35A	1976 Apr 22.87 >million years	Cylinder 720 full 310 empty	2.23 long 2.2 dia	1976 Apr 23.5 1976 May 1.0 1976 Oct 1.0	26.99 2.9 2.65	630.89 1423.4 1436.2	24418 41914 42166	177 35209 35778	35902 35863 35797	0.732 0.008 0.0002	184 - -
D	NATO 3A second stage	1976-35B	1976 Apr 22.87 38 days 1976 May 30	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1976 Apr 23.4	28.23	93.39	6826	179	717	0.039	175
D	NATO 3A third stage	1976-35C	1976 Apr 22.87 544 days 1977 Oct 18	Sphere-cone 66	1.32 long 0.94 dia	1976 Apr 29.2	26.99	630.39	24404	201	35850	0.730	187
D R	Cosmos 815	1976-36A	1976 Apr 28.40 12.9 days 1976 May 11.3	Sphere-cylinder 5900?	5.9 long 2.4 dia	1976 Apr 29.1	81.33	89.01	6603	218	231	0.001	11
D	Cosmos 815 rocket	1976-36B	1976 Apr 28.40 4 days 1976 May 2	Cylinder 2500?	7.5 long 2.6 dia	1976 Apr 29.1	81.33	88.82	6593	207	222	0.001	337
D	Capsule**	1976-36F	1976 Apr 28.40 22 days 1976 May 20	Ellipsoid 200?	0.9 long 1.9 dia	1976 May 11.1	81.30	88.79	6591	207	219	0.001	297
D	Fragments	1976-36C-E,G,H											

* Cosmos 814 passed close to Cosmos 803 about 1976 Apr 13.75, then intentionally re-entered?

**Ejected from 1976-36A about 1976 May 10

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 816	1976-37A	1976 Apr 28.57 1305 days 1979 Nov 24	Cylinder?	-	1976 Apr 29.0	65.83	94.56	6876	481	515	0.002	357
D	Cosmos 816 rocket	1976-37B	1976 Apr 28.57 1297 days 1979 Nov 16	Cylinder 2200?	7.4 long 2.4 dia	1976 Apr 29.7	65.83	94.46	6871	471	515	0.003	356
D	Fragments	1976-37C-AA											
T	NOSS 1* [Atlas]	1976-38A	1976 Apr 30.80 1600 years	Cylinder	-	1976 May 1.4	63.46	107.47	7488	1092	1128	0.002	277
	NOSS 1 rocket	1976-38B	1976 Apr 30.80 1000 years	-	-	1976 May 1.3	63.46	107.39	7485	1090	1124	0.002	289
T?	SSU 1	1976-38C	1976 Apr 30.80 1600 years	Box + aerials?	0.3 x 0.9 x 2.4?	1976 May 20.5	63.44	107.49	7489	1093	1129	0.002	88
T?	SSU 2	1976-38D	1976 Apr 30.80 1600 years	Box + aerials?	0.3 x 0.9 x 2.4?	1976 May 20.6	63.43	107.50	7490	1093	1130	0.002	73
T?	[Atlas]	1976-38E	1976 Apr 30.80 1600 years	-	-	1976 May 21.5	63.44	107.66	7498	1094	1145	0.003	89
T?	SSU 3	1976-38J	1976 Apr 30.80 1600 years	Box + aerials?	0.3 x 0.9 x 2.4?	1976 Jul 1.0	63.45	107.49	7489	1083	1139	0.004	-
	Fragments	1976-38F-H,K,L											

* Navy Ocean Surveillance Satellite: some of the objects listed as fragments may also be payloads.

	Name		Launch date, lifetime and descent data	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
L	Lageos*	1976-39A	1976 May 4.33 > million years	Sphere 411	0.60 dia	1976 May 5.8	109.86	225.41	12269	5837	5945	0.004	258
	Lageos third stage	1976-39B	1976 May 4.33 20 years	Sphere-cone 77	1.32 long 0.94 dia	1976 May 6.0	109.69	153.42	9493	309	5920	0.296	176
T?	Lageos apogee motor	1976-39C	1976 May 4.33 50000 years	Sphere-cone 50?	0.98 long? 0.76 dia?	1976 May 7.5	109.84	225.42	12269	5837	5945	0.004	260
D R	Cosmos 817	1976-40A	1976 May 5.33 12.9 days 1976 May 18.2	Sphere-cylinder 5900?	5.9 long? 2.4 dia	1976 May 6.1	64.99	89.47	6627	173	324	0.011	63
D	Cosmos 817 rocket	1976-40B	1976 May 5.33 5 days 1976 May 10	Cylinder 2500?	7.5 long 2.6 dia	1976 May 6.1	65.00	89.30	6618	173	307	0.010	62
D	Capsule** ?	1976-40D	1976 May 5.33 19 days 1976 May 24	-	- 2 dia?	1976 May 17.5	64.98	89.11	6609	169	292	0.009	56
D	Fragments	1976-40C,E,F											
	Molyniya 3E	1976-41A	1976 May 12.75 13¾ years	Windmill + 6 vanes 1500?	4.2 long? 1.6 dia	1976 May 17.4 1976 May 18.9	62.81 62.87	736.64 717.90	27019 26559	625 629	40657 39733	0.741 0.736	288 288
D	Molniya 3E launcher rocket	1976-41B	1976 May 12.75 85 days 1976 Aug 5	Cylinder 2500?	7.5 long 2.6 dia	1976 May 14.5	62.81	92.74	6788	214	606	0.029	117

* Laser Geodynamic Satellite

** Ejected from 1976-40A about 1976 May 17; possibly an engine

1976-41 continued on page 446

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Molniya 3E launcher	1976-41C	1976 May 12.75 119 days 1976 Sep 8	Irregular	-	1976 May 16.3	62.80	93.04	6803	217	632	0.031	123
	Molniya 3E rocket	1976-41D	1976 May 12.75 13¾ years	Cylinder 440	2.0 long 2.0 dia	1976 May 20.4	62.89	733.56	26944	621	40511	0.740	288
D	Fragment	1976-41E											
T	Comstar 1A	1976-42A	1976 May 13.94 >million years	Cylinder 1520 full 792 empty	2.82 long 2.36 dia	1976 May 14.0 1976 Aug 1.0	21.83 0.1	640.9 1436.0	24626 42163	550 35782	35945 35788	0.719 0	179 -
	Comstar 1A rocket	1976-42B	1976 May 13.94 6000 years	Cylinder 1815	8.6 long 3.0 dia	1976 May 14.0	21.82	649.2	24836	559	36357	0.721	179
	Meteor 25	1976-43A	1976 May 15.57 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1976 May 16.8	81.24	102.39	7249	846	895	0.003	270
	Meteor 25 rocket	1976-43B	1976 May 15.57 400 years	Cylinder 1440	3.8 long 2.6 dia	1976 May 16.7	81.24	102.49	7254	846	905	0.004	218
D	Cosmos 818	1976-44A	1976 May 18.46 293 days 1977 Mar 7	Ellipsoid 400?	1.8 long 1.2 dia	1976 May 19.3	71.05	92.08	6754	271	481	0.016	80
D	Cosmos 818 rocket	1976-44B	1976 May 18.46 163 days 1976 Oct 28	Cylinder 1500?	8 long 1.65 dia	1976 May 21.5	71.05	91.82	6742	275	452	0.013	76

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 819	1976-45A	1976 May 20.29	Sphere-cylinder	5.0 long	1976 May 21.0	65.00	89.44	6626	202	293	0.007	36
R			11.9 days	5700?	2.4 dia								
			1976 Jun 1.2										
D	Cosmos 819 rocket	1976-45B	1976 May 20.29	Cylinder	7.5 long	1976 May 21.5	65.01	89.27	6617	203	275	0.005	25
			10 days	2500?	2.6 dia								
			1976 May 30										
D	Fragment	1976-45C											
D	Cosmos 820	1976-46A	1976 May 21.29	Sphere-cylinder	6.5 long?	1976 May 22.0	81.36	88.78	6591	209	217	0.001	251
R			11.8 days	6300?	2.4 dia	1976 May 22.3	81.36	88.97	6601	209	236	0.002	273
			1976 Jun 2.1										
D	Cosmos 820 rocket	1976-46B	1976 May 21.29	Cylinder	7.5 long	1976 May 21.8	81.36	88.63	6584	199	212	0.001	285
			3 days	2500?	2.6 dia								
			1976 May 24										
D	Cosmos 820* engine	1976-46C	1976 May 21.29	Cone	1.5 long?	1976 Jun 1.6	81.36	88.74	6589	199	223	0.002	-
			20 days	600? full	2 dia?								
			1976 Jun 10										
D	Fragments	1976-46C,D											
T	P76-5** [Scout]	1976-47A	1976 May 22.32	-	-	1976 May 24.8	99.68	105.73	7406	996	1060	0.004	159
			1400 years										
	Altair rocket	1976-47B	1976 May 22.32	Cylinder	1.50 long	1976 May 25.9	99.68	105.73	7406	996	1060	0.004	154
			800 years	24	0.46 dia								
	Fragments	1976-47C,D											
D	Cosmos 821	1976-48A	1976 May 26.38	Sphere-cylinder	6.5 long?	1976 May 26.6	72.83	89.69	6637	204	314	0.008	68
R			12.8 days	6300?	2.4 dia	1976 Jun 2.1	72.82	89.50	6628	169	330	0.012	51
			1976 Jun 8.2										

*Jettisoned from 1976-46A about 1976 Jun 1 **Transit navigation satellite modified for ionospheric experiments

1976-48 continued on page 448

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 821 rocket	1976-48B	1976 May 26.38 12 days 1976 Jun 7	Cylinder 2500?	7.5 long 2.6 dia	1976 May 27.4	72.82	89.57	6631	204	302	0.007	69
D	Cosmos 821 engine	1976-48D	1976 May 26.38 19 days 1976 Jun 14	Cone 600? full	1.5 long? 2 dia?	1976 Jun 7.3	72.82	89.45	6625	167	326	0.012	41
D	Fragments	1976-48C,E,F											
D	Cosmos 822	1976-49A	1976 May 28.63 802 days 1978 Aug 8	Octagonal ellipsoid? 550?	1.8 long? 1.5 dia?	1976 Jun 1.9	74.05	94.54	6874	280	711	0.031	124
D	Cosmos 822 rocket	1976-49B	1976 May 28.63 574 days 1977 Dec 23	Cylinder 2200?	7.4 long 2.4 dia	1976 Jun 1.5	74.05	94.42	6868	276	704	0.031	123
T	Satellite Data System 2 [Titan 3B Agena D]	1976-50A	1976 Jun 2 10 years?	Cylinder?	-	1976 Jun 10	63.3	703.8	26225	380	39315	0.742	270*
	Agena D rocket	1976-50B	1976 Jun 2 10 years?	Cylinder 700	6 long? 1.5 dia	1976 Jun 18	63.3	700.2	26120	310	39175	0.744	270*
	Cosmos 823	1976-51A	1976 Jun 2.94 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1976 Jun 4.0	82.96	105.04	7374	980	1011	0.002	265
	Cosmos 823 rocket	1976-51B	1976 Jun 2.94 600 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Jun 3.8	82.96	104.92	7368	979	1000	0.001	252

*Approximate orbits.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 824	1976-52A	1976 Jun 8.30	Sphere-cylinder	6.5 long?	1976 Jun 9.4	71.37	89.82	6643	204	325	0.009	48
R			12.9 days	6300?	2.4 dia	1976 Jun 10.2	71.37	89.39	6621	169	317	0.011	58
			1976 Jun 21.2										
D	Cosmos 824 rocket	1976-52B	1976 Jun 8.30	Cylinder	7.5 long	1976 Jun 9.8	71.38	89.65	6634	203	309	0.008	42
			12 days	2500?	2.6 dia								
			1976 Jun 20										
D	Cosmos 824 engine*	1976-52E	1976 Jun 8.30	Cone	1.5 long?	1976 Jun 20.7	71.38	89.37	6620	166	318	0.011	37
			19 days	600? full	2 dia?								
			1976 Jun 27										
D	Fragments	1976-52C,D,F,G											
T	Marisat 2	1976-53A	1976 Jun 10.01	Cylinder	2.4 long?	1976 Jun 10.0	26.00	653.01	24933	185	36925	0.737	182
			> million years	655 full	1.9 dia?	1976 Jun 17.6	2.5	1436.6	42176	35788	35807	0.0002	-
				362 empty									
D	Marisat 2 second stage	1976-53B	1976 Jun 10.01	Cylinder + annulus	6.4 long	1976 Jun 15.9	28.54	93.66	6839	273	649	0.028	221
			441 days	350?	1.52 and								
			1977 Aug 25		2.44 dia								
	Marisat 2 third stage	1976-53F	1976 Jun 10.01	Sphere-cone 66	1.32 long	1976 Jun 27.3	25.96	647.1	24780	190	36613	0.735	192
			20 years		0.94 dia								
	Marisat 2 apogee motor	1976-53G	1976 Jun 10.01	-	-	Orbit similar to 1976-53A							
			> million years	293 full									
D	Fragments	1976-53C-E											

* Jettisoned from 1976-52A about 1976 Jun 20

Year of launch 1976 continued

Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
Cosmos 825	1976-54A	1976 Jun 15.55 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jun 25.3	73.99	114.74	7821	1397	1489	0.006	91
Cosmos 826	1976-54B	1976 Jun 15.55 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jun 18.6	74.00	116.33	7893	1484	1546	0.004	238
Cosmos 827	1976-54C	1976 Jun 15.55 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jun 22.2	74.00	114.96	7831	1415	1491	0.005	106
Cosmos 828	1976-54D	1976 Jun 15.55 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jun 24.8	73.99	115.18	7841	1435	1491	0.004	106
Cosmos 829	1976-54E	1976 Jun 15.55 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jun 18.7	74.00	115.39	7851	1453	1492	0.003	127
Cosmos 830	1976-54F	1976 Jun 15.55 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jun 24.3	74.00	115.61	7861	1471	1495	0.001	141
Cosmos 831	1976-54G	1976 Jun 15.55 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jun 21.5	74.00	115.85	7872	1477	1510	0.002	193
Cosmos 832	1976-54H	1976 Jun 15.55 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Jun 21.3	74.00	116.07	7882	1484	1523	0.002	228
Cosmos 825 rocket	1976-54J	1976 Jun 15.55 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Jun 19.3	73.99	117.99	7968	1488	1692	0.013	260

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 833	1976-55A	1976 Jun 16.55 12.6 days 1976 Jun 29.2	Sphere-cylinder 5900?	5.9 long? 2.4 dia	1976 Jun 17.5	62.82	89.44	6626	180	316	0.010	68
D	Cosmos 833 rocket	1976-55B	1976 Jun 16.55 7 days 1976 Jun 23	Cylinder 2500?	7.5 long 2.6 dia	1976 Jun 16.8	62.81	89.36	6622	177	311	0.010	64
D	Capsule? *	1976-55E	1976 Jun 16.55 22 days 1976 Jul 8	-	- 2 dia?	1976 Jun 29.3	62.82	89.16	6612	177	291	0.009	69
D	Fragments	1976-55C,D,F,G											
D	Intercosmos 15	1976-56A	1976 Jun 19.67 1247 days 1979 Nov 18	Octagonal ellipsoid? 550?	1.8 long? 1.5 dia?	1976 Jun 24.5	74.04	94.65	6879	484	518	0.002	351
	Intercosmos 15 rocket	1976-56B	1976 Jun 19.67 3.6 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Jun 23.9	74.04	94.57	6875	477	517	0.003	354
D r	Salyut 5 **	1976-57A	1976 Jun 22.76 412 days 1977 Aug 8	Cylinder + 3 wings 19000?	14 long 4.15 to 2.0 dia	1976 Jun 23.0 1976 Jun 25.4 1976 Jun 27.4	51.60 51.59 51.59	88.85 89.00 89.15	6599 6606 6614	208 212 214	233 244 257	0.002 0.002 0.003	130 111 100
D	Salyut 5 rocket	1976-57B	1976 Jun 22.76 8 days 1976 Jun 30	Cylinder 4000?	12 long? 4 dia	1976 Jun 23.1	51.61	88.80	6596	211	225	0.001	112
D	Fragments	1976-57C-K											

* Possibly an engine.

** Salyut 5 was de-orbited; a capsule was ejected and recovered on 1977 Feb 26.4.

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 834	1976-58A	1976 Jun 24.30 11.9 days 1976 Jul 6.2	Sphere-cylinder 5700?	5.0 long 2.4 dia	1976 Jun 25.4	81.37	89.05	6605	216	237	0.002	94
D	Cosmos 834 rocket	1976-58B	1976 Jun 24.30 6 days 1976 Jun 30	Cylinder 2500?	7.5 long 2.6 dia	1976 Jun 25.2	81.37	88.95	6600	216	227	0.001	93
T	[Titan 3C]	1976-59A	1976 Jun 26.13 > million years	-	-	1976 Jun 26.5 1976 Jul 1.0	26.3 0.5	633.0 1433.3	24445 42118	295 35620	35840 35860	0.727 0.003	180* -*
D	Titan 3C second stage	1976-59B	1976 Jun 26.13 4 days 1976 Jun 30	Cylinder 1900	6 long 3.0 dia	1976 Jun 26.2	28.60	90.41	6680	151	453	0.023	113
	Transtage	1976-59C	1976 Jun 26.13 >million years	Cylinder 1500?	6 long? 3.0 dia			Orbits similar to 1976-59A					
	Fragment	1976-59D											
D R	Cosmos 835	1976-60A	1976 Jun 29.31 12.84 days 1976 Jul 12.15	Sphere-cylinder 5900?	5.9 long? 2.4 dia	1976 Jun 30.6	64.96	89.41	6624	174	317	0.011	59
D	Cosmos 835 rocket	1976-60B	1976 Jun 29.31 5 days 1976 Jul 4	Cylinder 2500?	7.5 long 2.6 dia	1976 Jun 29.7	64.97	89.33	6620	175	308	0.010	58
D	Capsule** ?	1976-60C	1976 Jun 29.31 21 days 1976 Jul 20	-	- 2 dia?	1976 Jul 11.5	64.98	89.12	6610	172	291	0.009	51
D	Fragments	1976-60D,E											

*Unconfirmed orbits

** Ejected from 1976-60A on 1976 Jul 11; possibly an engine

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 836	1976-61A	1976 Jun 29.34 120 years	Cylinder + paddles? 750?	2 long? 1 dia?	1976 Jun 30.6	74.06	100.98	7183	791	818	0.002	106
	Cosmos 836 rocket	1976-61B	1976 Jun 29.34 100 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Jun 30.0	74.07	100.88	7178	784	815	0.002	88
	Cosmos 837 *	1976-62A	1976 Jul 1.34 8 years	Windmill + 6 vanes? 1250?	4.2 long? 1.6 dia?	1976 Jul 2.3	62.75	98.51	7065	438	936	0.035	259
D	Cosmos 837 launcher rocket	1976-62B	1976 Jul 1.34 35 days 1976 Aug 5	Cylinder 2500?	7.5 long 2.6 dia	1976 Jul 2.3	62.80	90.73	6689	215	406	0.014	125
D	Cosmos 837 launcher	1976-62C	1976 Jul 1.34 20 days 1976 Jul 21	Irregular	-	1976 Jul 2.3	62.82	90.87	6696	189	446	0.019	123
	Cosmos 837 rocket	1976-62E	1976 Jul 1.34 8 years	Cylinder 4800 full 440 empty	2.0 long 2.0 dia	1976 Jul 2.3	62.75	98.39	7059	440	922	0.034	260
D	Fragment	1976-62D											
D	Cosmos 838 **	1976-63A	1976 Jul 2.44 disintegrated	Cylinder?	-	1976 Jul 6.4	65.06	93.30	6812	428	440	0.0009	271
D	Cosmos 838 rocket	1976-63B	1976 Jul 2.44 1 day 1976 Jul 3	Cylinder 1500?	8 long? 2.5 dia?	1976 Jul 2.8	65.03	89.46	6628	117	382	0.020	48
D	Fragments	1976-63C-AS											

* Probable Molniya attempt; final stage shut down prematurely.

** Disintegrated during late June - early July 1977

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Soyuz 21*	1976-64A	1976 Jul 6.51 49.26 days 1976 Aug 24.77	Sphere-cylinder 6570?	7.5 long 2.2 dia	1976 Jul 7.2 1976 Jul 19.4	51.59 51.59	89.65 89.80	6638 6646	246 262	274 273	0.002 0.0008	249 324
2M R													
D	Soyuz 21 rocket	1976-64B	1976 Jul 6.51 3 days 1976 Jul 9	Cylinder 2500?	7.5 long 2.6 dia	1976 Jul 7.2	51.60	88.46	6579	183	219	0.003	87
D	[Titan 3D]	1976-65A	1976 Jul 8.78 158 days 1976 Dec 13	Cylinder 13300? full	15 long 3.0 dia	1976 Jul 10.7	97.00	88.54	6579	159	242	0.006	131
T?	SESP 74-2?**	1976-65B	1976 Jul 8.78 10 years	-	-	1976 Jul 16.1	97.53	179.00	10520	236	8048	0.371	291
T	Capsule	1976-65C	1976 Jul 8.78 60 years	Octagon? 60?	0.3 long? 0.9 dia?	1976 Jul 18.7	96.38	97.34	7008	628	632	0.0003	219
D	Titan 3D rocket	1976-65D	1976 Jul 8.78 1.41 days 1976 Jul 10.19	Cylinder 1900	6 long 3.0 dia	1976 Jul 9.0	97.00	88.31	6567	150	228	0.006	130
T	Palapa 1†	1976-66A	1976 Jul 8.98 > million years	Cylinder 574 full 282 empty	1.56 long 1.90 dia	1976 Jul 9.0 1976 Sep 1.0	24.66 0.05	645.61 1436.1	24744 42165	231 35764	36501 35809	0.733 0.0005	179 -
D	Palapa 1 second stage	1976-66B	1976 Jul 8.98 2 days 1976 Jul 10	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1976 Jul 9.1	28.73	87.97	6561	147	219	0.005	349

* Soyuz 21 docked with Salyut 5 on 1976 Jul 7.57; undocked 1976 Aug 24.63

** Small magnetospheric observatory

† First Indonesian satellite, launched by NASA

1976-66 continued on page 455

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Palapa 1 third stage	1976-66C	1976 Jul 8.98 20 years?	Sphere-cone 66	1.32 long 0.94 dia	1976 Jul 16.3	24.65	638.71	24570	239	36145	0.731	183
	Cosmos 839	1976-67A	1976 Jul 8.88 4000 years	Cylinder?	4 long? 2 dia?	1976 Jul 15.4	65.86	116.88	7919	984	2098	0.070	163
	Cosmos 839 rocket	1976-67B	1976 Jul 8.88 disintegrated	Cylinder 2200?	7.4 long 2.4 dia	1976 Jul 15.5	65.86	116.67	7910	972	2091	0.071	163
	Fragments	1976-67C-AX											
D R	Cosmos 840	1976-68A	1976 Jul 14.38 11.8 days 1976 Jul 26.2	Sphere-cylinder 5700?	5.0 long 2.4 dia	1976 Jul 15.6	72.87	89.73	6639	203	319	0.009	74
D	Cosmos 840 rocket	1976-68B	1976 Jul 14.38 11 days 1976 Jul 25	Cylinder 2500?	7.5 long 2.6 dia	1976 Jul 15.5	72.87	89.58	6632	198	309	0.008	66
D	Fragment	1976-68C											
	Cosmos 841	1976-69A	1976 Jul 15.55 120 years	Cylinder + paddles? 750?	2 long? 1 dia?	1976 Jul 17.8	74.05	100.83	7176	787	808	0.001	3
	Cosmos 841 rocket	1976-69B	1976 Jul 15.55 100 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Jul 25.6	74.05	100.74	7171	779	807	0.002	5

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 842	1976-70A	1976 Jul 21.43 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1976 Aug 1.5	82.98	104.96	7370	972	1011	0.003	253
	Cosmos 842 rocket	1976-70B	1976 Jul 21.43 600 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Jul 24.5	82.98	104.84	7364	971	1000	0.002	269
D	Cosmos 843 *	1976-71A	1976 Jul 21.64 <0.36 day 1976 Jul 21	Cylinder?	4 long? 2 dia?	1976 Jul 21.7	65.08	89.27	6617	132	346	0.016	36
D	Cosmos 843 rocket	1976-71B	1976 Jul 21.64 2 days 1976 Jul 23	Cylinder 1500?	8 long? 2.5 dia?	1976 Jul 23.0	65.10	88.19	6564	127	244	0.009	37
D	Cosmos 844 **	1976-72A	1976 Jul 22.66 39 days 1976 Aug 30	Sphere-cylinder 6700?	7 long? 2.4 dia	1976 Jul 25.4	67.15	89.76	6641	172	353	0.014	70
D	Cosmos 844 rocket	1976-72B	1976 Jul 22.66 8 days 1976 Jul 30	Cylinder 2500?	7.5 long 2.6 dia	1976 Jul 24.0	67.14	89.67	6637	171	346	0.013	73
D	Fragments	1976-72C-KJ											
T	Comstar 1B	1976-73A	1976 Jul 22.92 > million years	Cylinder 1520 full 792 empty	2.82 long 2.36 dia	1976 Jul 22.9 1976 Nov 1.0	21.81 0.1	641.03 1436.2	24627 42166	552 35780	35946 35795	0.719 0.0002	179 -
	Comstar 1B rocket	1976-73B	1976 Jul 22.92 6000 years	Cylinder 1815	8.6 long 3.0 dia	1976 Jul 22.9	21.82	650.92	24880	561	36442	0.721	179

* Probably intended to pass close to Cosmos 839

** Exploded on 1976 Jul 25

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Molniya 1AL	1976-74A	1976 Jul 23.66 10.9 years	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1976 Jul 30.0 1976 Sep 1.0	63.01 62.9	700.93 717.67	26139 26554	476 515	39045 39836	0.738 0.740	280 -
D	Molniya 1AL launcher rocket	1976-74B	1976 Jul 23.66 71 days 1976 Oct 2	Cylinder 2500?	7.5 long 2.6 dia	1976 Jul 23.8	62.90	91.54	6729	239	462	0.017	60
D	Molniya 1AL launcher	1976-74C	1976 Jul 23.66 57 days 1976 Sep 18	Irregular	-	1976 Jul 26.0	62.89	91.77	6740	215	509	0.022	60
	Molniya 1AL rocket	1976-74E	1976 Jul 23.66 10.9 years	Cylinder 440	2.0 long 2.0 dia	1976 Aug 5.2	62.90	698.49	26078	480	38919	0.737	280
D	Fragment	1976-74D											
	Cosmos 845	1976-75A	1976 Jul 27.23 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1976 Jul 28.1	74.06	95.25	6908	514	546	0.002	1
	Cosmos 845 rocket	1976-75B	1976 Jul 27.23 10 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Jul 27.7	74.06	95.16	6904	504	547	0.003	356
D	Fragments	1976-75C-H											
D	Intercosmos 16*	1976-76A	1976 Jul 27.50 1078 days 1979 Jul 10	Octagonal ellipsoid? 550?	1.8 long? 1.5 dia?	1976 Aug 2.1	50.57	94.36	6869	464	517	0.004	38
	Intercosmos 16 rocket	1976-76B	1976 Jul 27.50 3.6 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Aug 28.1	50.57	94.23	6862	451	517	0.005	22

* Payload includes Swedish experiments.

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	NOAA 5 (ITOS H)	1976-77A	1976 Jul 29.71 10000 years	Box 340	1.25 long 1.02 square	1976 Jul 31.5	102.10	116.34	7894	1509	1522	0.0008	242
	NOAA 5 second stage	1976-77B	1976 Jul 29.71 disintegrated	Cylinder + annulus? 350?	6.4 long? 1.52 and 2.44 dia?	1976 Aug 1.5	102.08	116.33	7893	1507	1523	0.001	227
	Fragments	1976-77C-DE											
	Cosmos 846	1976-78A	1976 Jul 29.83 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1976 Aug 1.5	82.92	104.81	7363	954	1015	0.004	292
	Cosmos 846 rocket	1976-78B	1976 Jul 29.83 600 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Jul 30.3	82.93	104.68	7356	953	1003	0.003	303
D R	Cosmos 847	1976-79A	1976 Aug 4.56 12.61 days 1976 Aug 17.17	Sphere-cylinder 5900?	5.9 long? 2.4 dia	1976 Aug 5.0	62.82	89.50	6629	181	321	0.011	78
D	Cosmos 847 rocket	1976-79B	1976 Aug 4.56 7 days 1976 Aug 11	Cylinder 2500?	7.5 long 2.6 dia	1976 Aug 5.1	62.78	89.39	6623	179	311	0.010	71
D	Capsule?*	1976-79D	1976 Aug 4.56 19 days 1976 Aug 23	-	- 2 dia?	1976 Aug 16.5	62.82	89.21	6614	165	307	0.011	-
D	Fragments	1976-79C,E											

* Possibly an engine

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Satellite Data System 3 [Titan 3B Agena D]	1976-80A	1976 Aug 6 10 years?	Cylinder?	-	1976 Aug 14	63.3	703.8	26225	380	39315	0.742	270*
	Agena D rocket	1976-80B	1976 Aug 6 10 years?	Cylinder 700	6 long? 1.5 dia	1976 Aug 22	63.3	700.2	26120	310	39175	0.744	270*
D	Luna 24 launcher	1976-81C	1976 Aug 9.63 6 days 1976 Aug 15	-	-	1976 Aug 10.0	51.54	88.74	6593	188	242	0.004	330
D	Luna 24 launcher rocket	1976-81D	1976 Aug 9.63 5 days 1976 Aug 14	Cylinder 4000?	12 long? 4 dia	1976 Aug 11.3	51.52	88.55	6584	186	225	0.003	339
D	Fragment	1976-81B											
D R	Cosmos 848	1976-82A	1976 Aug 12.57 12.62 days 1976 Aug 25.19	Sphere-cylinder 5700?	5.0 long 2.4 dia	1976 Aug 14.3	62.80	89.57	6633	206	303	0.007	87
D	Cosmos 848 rocket	1976-82B	1976 Aug 12.57 12 days 1976 Aug 24	Cylinder 2500?	7.5 long 2.6 dia	1976 Aug 13.5	62.79	89.46	6627	204	294	0.007	79
D	Fragments	1976-82C-E											
D	Cosmos 849	1976-83A	1976 Aug 18.40 614 days 1978 Apr 24	Ellipsoid 400?	1.8 long 1.2 dia	1976 Aug 20.4	70.97	95.95	6943	264	865	0.043	84
D	Cosmos 849 rocket	1976-83B	1976 Aug 18.40 441 days 1977 Nov 2	Cylinder 1500?	8 long 1.65 dia	1976 Aug 19.4	70.97	95.65	6928	268	831	0.040	85
D	Fragment	1976-83C											

Space Vehicle: Luna 24, 1976-81A; ascent stage, 1976-81E. *Approximate orbits.

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 850	1976-84A	1976 Aug 26.46 263 days 1977 May 16	Ellipsoid 400?	1.8 long 1.2 dia	1976 Aug 26.6	70.94	92.20	6761	272	493	0.016	81
D	Cosmos 850 rocket	1976-84B	1976 Aug 26.46 141 days 1977 Jan 14	Cylinder 1500?	8 long 1.65 dia	1976 Aug 28.3	70.94	91.99	6750	275	469	0.014	82
	Cosmos 851	1976-85A	1976 Aug 27.61 50 years	Cylinder + 2 vanes? 2500?	5 long? 1.5 dia?	1976 Aug 28.7	81.20	96.78	6981	569	637	0.005	264
	Cosmos 851 rocket	1976-85B	1976 Aug 27.61 50 years	Cylinder 1440	3.8 long 2.6 dia	1976 Aug 28.7	81.21	96.80	6982	554	654	0.007	217
D R	Cosmos 852	1976-86A	1976 Aug 28.38 12.85 days 1976 Sep 10.23	Sphere-cylinder 5900?	5.9 long? 2.4 dia	1976 Aug 29.1	64.99	89.54	6631	173	332	0.012	66
D	Cosmos 852 rocket	1976-86B	1976 Aug 28.38 5 days 1976 Sep 2	Cylinder 2500?	7.5 long 2.6 dia	1976 Aug 29.1	64.99	89.36	6622	172	315	0.011	65
D	Capsule?*	1976-86D	1976 Aug 28.38 19 days 1976 Sep 16	-	- 2 dia?	1976 Sep 11.2	64.99	89.07	6607	167	291	0.009	-
D	Fragments	1976-86C,E,F											
D	China 6	1976-87A	1976 Aug 30.49 817 days 1978 Nov 25	Spheroid? 270?	1.25 dia?	1976 Aug 31.0	69.16	108.77	7548	195	2145	0.129	139
D	China 6 rocket	1976-87B	1976 Aug 30.49 523 days 1978 Feb 4	Cylinder	-	1976 Aug 30.8	69.17	108.72	7546	190	2145	0.129	139

* Possibly an engine

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 853 *	1976-88A	1976 Sep 1.14 121 days 1976 Dec 31	Windmill + 6 vanes? 1250?	4.2 long? 1.6 dia?	1976 Sep 3.3	62.82	91.57	6730	243	461	0.016	137
D	Cosmos 853 launcher rocket	1976-88B	1976 Sep 1.14 39 days 1976 Oct 10	Cylinder 2500?	7.5 long 2.6 dia	1976 Sep 3.3	62.83	91.20	6712	213	454	0.018	129
D	Cosmos 853 rocket	1976-88C	1976 Sep 1.14 261 days 1977 May 20	Cylinder 4800 full 440 empty	2.0 long 2.0 dia	1976 Sep 3.2	62.78	91.64	6734	240	471	0.017	130
D	Cosmos 853 launcher	1976-88D	1976 Sep 1.14 99 days 1976 Dec 9	Irregular	-	1976 Sep 3.4	62.81	91.68	6736	242	473	0.017	133
T	TIP 3 [Scout]	1976-89A	1976 Sep 1.88 4 years	Dumb-bell? 94?	7.3 long? 0.59 dia?	1976 Sep 4.3	90.31	96.02	6947	348	789	0.032	155
D	Altair rocket	1976-89B	1976 Sep 1.88 667 days 1978 Jun 29	Cylinder 24	1.50 long 0.46 dia	1976 Sep 4.3	90.32	95.99	6945	348	786	0.031	154
D	Fragments	1976-89C,D											
D	Cosmos 854	1976-90A	1976 Sep 3.39 12.85 days 1976 Sep 16.24	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1976 Sep 3.7 1976 Sep 5.1	81.35 81.35	89.27 89.02	6616 6603	167 168	308 282	0.011 0.009	83 80
R													
D	Cosmos 854 rocket	1976-90B	1976 Sep 3.39 4 days 1976 Sep 7	Cylinder 2500?	7.5 long 2.6 dia	1976 Sep 3.9	81.35	89.12	6608	166	294	0.010	82

* Cosmos 853 may be a failed Molniya satellite; final stage failed to ignite

1976-90 continued on page 462

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 854 engine	1976-90C	1976 Sep 3.39 16 days 1976 Sep 19	Cone 600? full	1.5 long? 2 dia?	1976 Sep 17.2	81.35	88.77	6591	159	266	0.008	-
D	Fragment	1976-90D											
T	AMS 1* [Thor Burner 2]	1976-91A	1976 Sep 11.34 80 years	450	6.40 long 1.68 dia	1976 Sep 14.3	98.70	101.60	7211	818	848	0.002	187
	Burner 2 rocket	1976-91B	1976 Sep 11.34 60 years	Sphere-cone 66	1.32 long 0.94 dia	1976 Sep 16.8	98.71	101.60	7211	817	849	0.002	166
	Fragments	1976-91C-G											
	Statsionar - Raduga 2	1976-92A	1976 Sep 11.77 >million years	-	-	1976 Sep 12.5	0.3	1440	42278	35900	35900	0	-**
D	Raduga 2 launcher rocket	1976-92B	1976 Sep 11.77 3 days 1976 Sep 14	Cylinder 4000?	12 long? 4 dia	1976 Sep 12.4	51.50	88.15	6564	177	195	0.001	316
D	Raduga 2 launcher	1976-92C	1976 Sep 11.77 1 day 1976 Sep 12	Irregular	-	1976 Sep 12.1	51.48	88.28	6571	189	196	0.001	27
D	Raduga 2 rocket	1976-92D	1976 Sep 11.77 311 days 1977 Jul 19	Cylinder 1900?	3.9 long? 3.9 dia	1976 Oct 2.1	47.33	633.94	24450	321	35823	0.726	5
D	Fragment	1976-92E											
D	Soyuz 22	1976-93A	1976 Sep 15.41 7.91 days 1976 Sep 23.32	Sphere-cylinder + 2 wings 6570?	7.5 long 2.3 dia	1976 Sep 15.5 1976 Sep 16.6 1976 Sep 22.5	64.75 64.75 64.75	89.31 89.58 89.42	6619 6632 6624	185 249 239	296 259 253	0.008 0.001 0.001	71 149 140
2M													
R													

* USAF Advanced Meteorological Satellite (Block 5D).

** Approximate orbit. There may be a separated apogee motor in a similar orbit.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Soyuz 22 rocket	1976-93B	1976 Sep 15.41 5 days 1976 Sep 20	Cylinder 2500?	7.5 long 2.6 dia	1976 Sep 16 8	64.76	89.03	6605	182	272	0.007	66
D	Fragment*	1976-93C											
D	[Titan 3B Agena D]	1976-94A	1976 Sep 15.79 51 days 1976 Nov 5	Cylinder 3000?	8 long? 1.5 dia	1976 Sep 16.4	96.39	89.18	6611	135	330	0.015	144
D	Fragment	1976-94B											
D R	Cosmos 855	1976-95A	1976 Sep 21.49 11.80 days 1976 Oct 3.29	Sphere-cylinder 5900?	5.9 long 2.4 dia	1976 Sep 22.4	72.88	89.96	6650	202	341	0.010	76
D	Cosmos 855 rocket	1976-95B	1976 Sep 21.49 11 days 1976 Oct 2	Cylinder 2500?	7.6 long 2.6 dia	1976 Sep 22.4	72.87	89.78	6641	197	328	0.010	69
D	Capsule	1976-95D	1976 Sep 21.49 17 days 1976 Oct 8	Ellipsoid 200?	0.9 long 1.9 dia	1976 Oct 2.6	72.88	89.82	6643	199	330	0.010	-
D	Fragment	1976-95C											
D R	Cosmos 856	1976-96A	1976 Sep 22.40 12.87 days 1976 Oct 5.27	Sphere-cylinder 5900?	5.9 long 2.4 dia	1976 Sep 23.4	65.01	89.53	6630	203	300	0.007	65
D	Cosmos 856 rocket	1976-96B	1976 Sep 22.40 8 days 1976 Sep 30	Cylinder 2500?	7.5 long 2.6 dia	1976 Sep 23.1	65.02	89.37	6622	202	286	0.006	55
D	Capsule**	1976-96E	1976 Sep 22.40 24 days 1976 Oct 16	Ellipsoid 200?	0.9 long 1.9 dia	1976 Oct 3.7	65.01	89.41	6624	201	291	0.007	61
D	Fragments	1976-96C,D											

* Probably the MKF-6 multizonal camera shroud (decayed 1976 Sep 16).

** Ejected from 1976-96A on 1976 Oct 3.

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 857	1976-97A	1976 Sep 24.63	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1976 Sep 25.7	62.80	89.50	6629	179	323	0.011	73
R			12.61 days 1976 Oct 7.24			1976 Oct 4.4	62.81	89.56	6632	177	331	0.012	74
D	Cosmos 857 rocket	1976-97B	1976 Sep 24.63 4.66 days 1976 Sep 29.29	Cylinder 2500?	7.5 long 2.6 dia	1976 Sep 24.8	62.79	89.39	6624	176	315	0.010	68
D	Cosmos 857 engine*	1976-97C	1976 Sep 24.63 21 days 1976 Oct 15	Cone 600? full	1.5 long? 2 dia?	1976 Oct 6.4	62.80	89.49	6629	176	325	0.011	73
D	Fragments	1976-97D-F											
	Cosmos 858	1976-98A	1976 Sep 29.30 120 years	Cylinder + paddles? 750?	2 long? 1 dia?	1976 Sep 30.6	74.06	100.93	7181	792	813	0.001	19
	Cosmos 858 rocket	1976-98B	1976 Sep 29.30 100 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Sep 30.5	74.06	100.82	7175	783	811	0.002	33
D	Cosmos 859	1976-99A	1976 Oct 10.40	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1976 Oct 11.1	65.00	89.60	6633	173	337	0.012	67
R			10.9 days 1976 Oct 21.3			1976 Oct 13.4	64.99	89.36	6621	172	314	0.011	66
D	Cosmos 859 rocket	1976-99B	1976 Oct 10.40 5.27 days 1976 Oct 15.67	Cylinder 2500?	7.5 long 2.6 dia	1976 Oct 10.6	65.00	89.52	6629	172	330	0.012	71
D	Cosmos 859 engine	1976-99E	1976 Oct 10.40 15 days 1976 Oct 25	Cone 600? full	1.5 long? 2 dia?	1976 Oct 20.6	64.99	89.01	6604	167	285	0.009	61
D	Fragments	1976-99C,D											

* Jettisoned from 1976-97A on 1976 Oct 6

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D 2M R	Soyuz 23*	1976-100A	1976 Oct 14.74 2.00 days 1976 Oct 16.74	Sphere-cylinder 6570?	7.5 long 2.3 dia	1976 Oct 15.0 1976 Oct 15.9	51.61 51.58	88.56 89.60	6584 6636	188 246	224 269	0.003 0.002	74 233
D	Soyuz 23 rocket	1976-100B	1976 Oct 14.74 2 days 1976 Oct 16	Cylinder 2500?	7.5 long 2.6 dia	1976 Oct 15.4	51.61	88.46	6580	184	219	0.003	83
T	Marisat 3	1976-101A	1976 Oct 14.95 >million years	Cylinder 655 full 362 empty	2.4 long? 1.9 dia?	1976 Oct 15.0 1976 Oct 22.6	26.00 2.6	652.92 1436.2	24931 42166	185 35051	36920 36525	0.737 0.017	174 -
D	Marisat 3 second stage	1976-101B	1976 Oct 14.95 32 days 1976 Nov 15	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1976 Oct 16.4	28.58	92.40	6778	182	618	0.032	178
D	Marisat 3 third stage	1976-101E	1976 Oct 14.95 210 days 1977 May 12	Sphere-cone 66	1.32 long 0.94 dia	1976 Oct 15.0	26.00	652.92	24931	185	36920	0.737	174**
	Marisat 3 apogee motor	1976-101F	1976 Oct 14.95 >million years	- 293 full	-	Orbit similar to 1976-101A							
D	Fragments	1976-101C,D											
	Meteor 26	1976-102A	1976 Oct 15.96 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1976 Oct 22.9	81.27	102.48	7253	857	892	0.002	263
	Meteor 26 rocket	1976-102B	1976 Oct 15.96 400 years	Cylinder 1440	3.8 long 2.6 dia	1976 Oct 17.8	81.27	102.59	7258	836	924	0.006	192

* Soyuz 23 rendezvous with Salyut 5 about 1976 Oct 15.8, but failed to dock.

** Approximate orbit.

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 860*	1976-103A	1976 Oct 17.76 600 years	Cone-cylinder	6 long? 2 dia?	1976 Oct 23.4 1976 Nov 12.9	65.04 64.70	89.66 104.33	6637 7342	252 919	265 1008	0.001 0.006	274 350
D	Cosmos 860 rocket	1976-103D	1976 Oct 17.76 29 days 1976 Nov 15	Cylinder 1500?	8 long? 2.5 dia?	1976 Nov 12.0	65.03	89.49	6628	243	257	0.001	200
D	Cosmos 860 platform	1976-103B	1976 Oct 17.76 73 days 1976 Dec 29	Irregular	-	1976 Nov 12.1	65.04	89.54	6631	244	261	0.001	286
D	Fragments	1976-103C,E											
	Cosmos 861**	1976-104A	1976 Oct 21.71 600 years	Cone-cylinder	6 long? 2 dia?	1976 Oct 24.4 1977 Jan 24.5	64.96 64.86	89.65 104.31	6636 7341	251 921	265 1005	0.001 0.006	269 210
D	Cosmos 861 rocket	1976-104D	1976 Oct 21.71 65 days 1976 Dec 25	Cylinder 1500?	8 long? 2.5 dia?	1976 Dec 21.9	64.96	89.28	6618	226	253	0.002	264
D	Cosmos 861 platform	1976-104C	1976 Oct 21.71 107 days 1977 Feb 4	Irregular	-	1976 Dec 21.6	64.96	89.55	6631	244	262	0.001	260
D	Fragment	1976-104B											
	Cosmos 862 †	1976-105A	1976 Oct 22.39 disintegrated	Windmill + 6 vanes? 1250?	4.2 long? 1.6 dia?	1976 Oct 22.9 1976 Nov 1.0	62.81 62.81	712.32 718.11	26422 26565	571 598	39516 39775	0.737 0.738	318 -
D	Cosmos 862 launcher rocket	1976-105B	1976 Oct 22.39 66 days 1976 Dec 27	Cylinder 2500?	7.5 long 2.6 dia	1976 Oct 22.5	62.79	92.20	6762	222	545	0.024	116

* 1976-103B and 1976-103D attached to 1976-103A until orbit change on 1976 Nov 10.78

**1976-104C and 1976-104D attached to 1976-104A until orbit change about 1976 Dec 20

†Disintegrated on 1977 Mar 15

1976-105 continued on page 467

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 862 launcher	1976-105C	1976 Oct 22.39 49 days 1976 Dec 10	Irregular	-	1976 Oct 22.5	62.84	92.47	6775	198	596	0.029	114
	Cosmos 862 rocket	1976-105D	1976 Oct 22.39 100 years?	Cylinder 440	2.0 long 2.0 dia	1976 Oct 29.8	62.70	711.90	26411	606	39460	0.736	318
	Fragments	1976-105E-P											
D	Cosmos 863	1976-106A	1976 Oct 25.61 10.68 days	Sphere-cylinder	6.5 long? 2.4 dia	1976 Oct 26.3 1976 Oct 26.7	62.81 62.81	89.74 89.40	6641 6624	178 170	348 322	0.013 0.011	85 75
R			1976 Nov 5.29	6300?									
D	Cosmos 863 rocket	1976-106B	1976 Oct 25.61 7 days 1976 Nov 1	Cylinder 2500?	7.5 long 2.6 dia	1976 Oct 26.3	62.80	89.60	6634	178	334	0.012	82
D	Cosmos 863 engine	1976-106E	1976 Oct 25.61 17 days 1976 Nov 11	Cone 600? full	1.5 long? 2 dia?	1976 Nov 6.0	62.80	89.28	6618	167	313	0.011	71
D	Fragments	1976-106C,D,F-K											
	Statsionar - Ekran 1	1976-107A	1976 Oct 26.62 >million years	Cylinder + plate	-	1976 Oct 27.5	0.2	1437	42228	35850	35850	0	- *
D	Ekran 1 launcher rocket	1976-107B	1976 Oct 26.62 3 days 1976 Oct 29	Cylinder 4000?	12 long? 4 dia	1976 Oct 27.0	51.48	88.18	6565	178	196	0.001	305
D	Ekran 1 launcher	1976-107C	1976 Oct 26.62 1 day 1976 Oct 27	Irregular	-	1976 Oct 27.0	51.47	88.08	6560	181	183	0.0002	16
D	Ekran 1 rocket	1976-107D	1976 Oct 26.62 243 days 1977 Jun 26	Cylinder 1900?	3.9 long? 3.9 dia	1976 Nov 20.9	47.21	626.78	24266	311	35464	0.724	7
D	Fragment	1976-107E											

* Approximate orbit. There may be a separated apogee motor in a similar orbit. Ekran means screen

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 864	1976-108A	1976 Oct 29.53 1200 years	Cylinder 700?	1.4 long 2.0 dia	1976 Oct 30.2	82.94	104.90	7367	966	1011	0.003	292
	Cosmos 864 rocket	1976-108B	1976 Oct 29.53 600 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Oct 30.1	82.94	104.79	7361	966	1000	0.002	291
D R	Cosmos 865	1976-109A	1976 Nov 1.48 11.78 days 1976 Nov 13.26	Sphere-cylinder 5700?	5.0 long 2.4 dia	1976 Nov 2.4	72.88	89.81	6643	203	326	0.009	67
D	Cosmos 865 rocket	1976-109B	1976 Nov 1.48 13 days 1976 Nov 14	Cylinder 2500?	7.5 long 2.6 dia	1976 Nov 1.7	72.87	89.69	6637	206	311	0.008	66
D	Fragments	1976-109C-H											
D R	Cosmos 866	1976-110A	1976 Nov 11.45 11.9 days 1976 Nov 23.3	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1976 Nov 11.9 1976 Nov 12.7	64.98 64.98	89.16 89.45	6612 6626	180 177	287 318	0.008 0.011	50 52
D	Cosmos 866 rocket	1976-110B	1976 Nov 11.45 3 days 1976 Nov 14	Cylinder 2500?	7.5 long 2.6 dia	1976 Nov 12.1	64.98	88.93	6600	168	276	0.008	50
D	Cosmos 866 engine*	1976-110F	1976 Nov 11.45 13 days 1976 Nov 24	Cone 600? full	1.5 long? 2 dia?	1976 Nov 23.1	64.97	88.06	6557	124	233	0.008	63
D	Fragments	1976-110C-E,G											
D R	Cosmos 867	1976-111A	1976 Nov 23.69 12.64 days 1976 Dec 6.33	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1976 Nov 23.8 1976 Nov 26.4	62.83 62.83	91.06 92.07	6704 6755	250 352	402 401	0.011 0.004	114 88

* Jettisoned from 1976-110A about 1976 Nov 22

1976-111 continued on page 469

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 867 rocket	1976-111B	1976 Nov 23.69 71 days 1977 Feb 1	Cylinder 2500?	7.5 long 2.6 dia	1976 Nov 30.6	62.80	90.83	6692	249	383	0.010	107
D	Cosmos 867 engine*	1976-111F	1976 Nov 23.69 410 days 1978 Jan 7	Cone 600? full	1.5 long? 2 dia?	1976 Dec 6.4	62.82	92.02	6752	351	397	0.003	95
D	Fragments	1976-111C-E,G-K											
	Prognoz 5	1976-112A	1976 Nov 25.17 10 years?	Spheroid + 4 vanes 930	1.8 dia?	1977 Jan 1.0	65.2	5728	106047	777	198560	0.933	-
D	Prognoz 5 launcher rocket	1976-112B	1976 Nov 25.17 59 days 1977 Jan 23	Cylinder 2500?	7.5 long 2.6 dia	1976 Nov 25.5	64.97	91.48	6726	231	464	0.017	66
D	Prognoz 5 launcher	1976-112C	1976 Nov 25.17 41 days 1977 Jan 5	Irregular	-	1976 Nov 26.5	65.00	91.50	6727	205	492	0.021	65
	Prognoz 5 rocket	1976-112E	1976 Nov 25.17 10 years?	Cylinder 440	2.0 long 2.0 dia	Orbit similar to 1976-112A							
D	Fragment	1976-112D											
D	Cosmos 868	1976-113A	1976 Nov 26.61 589 days 1978 Jul 8	Cylinder?	-	1976 Nov 26.6 1976 Nov 26.9	65.05 65.04	89.94 93.29	6651 6811	110 422	436 444	0.025 0.002	51 287
D	Cosmos 868 rocket	1976-113B	1976 Nov 26.61 1 day 1976 Nov 27	Cylinder 1500?	8 long? 2.5 dia?	1976 Nov 27.1	64.98	88.64	6586	113	303	0.014	53

* Jettisoned from 1976-111A about 1976 Dec 5

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 869	1976-114A	1976 Nov 29.67	Sphere-cylinder +2 wings 6570?	7.5 long 2.2 dia	1976 Nov 30.0	51.76	89.36	6624	198	293	0.007	89
R			17.7 days			1976 Dec 10.3	51.78	91.06	6707	268	390	0.009	127
			1976 Dec 17.4			1976 Dec 12.7	51.77	90.56	6682	299	309	0.001	254
D	Cosmos 869 rocket	1976-114B	1976 Nov 29.67 7 days 1976 Dec 6	Cylinder 2500?	7.5 long 2.6 dia	1976 Nov 29.9	51.78	89.24	6618	193	286	0.007	89
	Cosmos 870	1976-115A	1976 Dec 2.01 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1976 Dec 6.6	74.00	95.26	6909	513	548	0.003	352
	Cosmos 870 rocket	1976-115B	1976 Dec 2.01 10 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Dec 4.6	74.00	95.14	6903	501	548	0.003	1
3d	Fragments	1976-115C-F											
	Molniya 2R	1976-116A	1976 Dec 2.12 14¾ years	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia	1976 Dec 6.3	62.88	735.70	26996	637	40599	0.740	288
						1976 Dec 10.3	62.57	717.93	26560	575	39789	0.738	288
D	Molniya 2R launcher	1976-116B	1976 Dec 2.12 92 days 1977 Mar 4	Irregular	-	1976 Dec 3.1	62.86	92.90	6796	211	624	0.030	119
D	Molniya 2R launcher rocket	1976-116C	1976 Dec 2.12 67 days 1977 Feb 7	Cylinder 2500?	7.5 long 2.6 dia	1976 Dec 3.6	62.86	92.89	6795	214	620	0.030	121
	Molniya 2R rocket	1976-116D	1976 Dec 2.12 14¾ years	Cylinder 440	2.0 long 2.0 dia	1976 Dec 7.2	62.88	732.04	26907	629	40429	0.740	288
D	Fragments	1976-116E,F											

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	China 7*	1976-117A	1976 Dec 7.19	Cylinder?	-	1976 Dec 10.3	59.45	91.01	6704	172	479	0.023	158
r			26 days	1st 3 days		1976 Dec 11.3	59.45	90.92	6700	174	469	0.022	158
			1977 Jan 2	3600, then 1200?									
D	China 7 rocket	1976-117B	1976 Dec 7.19	Cylinder	-	1976 Dec 7.8	59.45	91.00	6703	169	481	0.023	154
			22 days										
			1976 Dec 29										
D	Fragment	1976-117C											
	Cosmos 871	1976-118A	1976 Dec 7.43	Spheroid	1.0 long?	1976 Dec 12.4	74.03	114.74	7821	1420	1466	0.003	94
			8000 years	40?	0.8 dia?								
	Cosmos 872	1976-118B	1976 Dec 7.43	Spheroid	1.0 long?	1976 Dec 10.7	74.03	114.53	7812	1401	1466	0.004	84
			7000 years	40?	0.8 dia?								
	Cosmos 873	1976-118C	1976 Dec 7.43	Spheroid	1.0 long?	1976 Dec 12.5	74.03	115.60	7860	1466	1498	0.002	255
			10000 years	40?	0.8 dia?								
	Cosmos 874	1976-118D	1976 Dec 7.43	Spheroid	1.0 long?	1976 Dec 11.0	74.03	115.82	7870	1466	1518	0.003	270
			10000 years	40?	0.8 dia?								
	Cosmos 875	1976-118E	1976 Dec 7.43	Spheroid	1.0 long?	1976 Dec 12.4	74.03	114.95	7831	1439	1466	0.002	87
			9000 years	40?	0.8 dia?								
	Cosmos 876	1976-118F	1976 Dec 7.43	Spheroid	1.0 long?	1976 Dec 11.7	74.03	116.07	7882	1466	1541	0.005	261
			10000 years	40?	0.8 dia?								

* A Capsule returned to Earth - possibly about 1976 Dec 10.3, although object 1976-117C (decayed Dec 9) might be the Capsule.

1976-118 continued on page 472

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 877	1976-118G	1976 Dec 7.43 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Dec 11.7	74.03	115.15	7840	1457	1466	0.001	100
	Cosmos 878	1976-118H	1976 Dec 7.43 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1976 Dec 11.0	74.03	115.37	7850	1466	1477	0.001	274
	Cosmos 871 rocket	1976-118J	1976 Dec 7.43 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Dec 12.2	74.01	117.71	7956	1463	1692	0.014	265
D R	Cosmos 879	1976-119A	1976 Dec 9.42 12.83 days 1976 Dec 22.25	Sphere-cylinder 5700?	5.0 long 2.4 dia	1976 Dec 9.5	81.37	88.90	6597	213	225	0.001	336
D	Cosmos 879 rocket	1976-119B	1976 Dec 9.42 3 days 1976 Dec 12	Cylinder 2500?	7.5 long 2.6 dia	1976 Dec 10.3	81.38	88.66	6585	196	218	0.002	301
D	Fragments	1976-119C,D											
	Cosmos 880	1976-120A	1976 Dec 9.84 30 years	Cylinder?	4 long? 2 dia?	1976 Dec 12.4	65.85	96.44	6967	560	617	0.004	359
	Cosmos 880 rocket	1976-120B	1976 Dec 9.84 30 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Dec 13.1	65.85	96.33	6961	551	615	0.005	14
27d	Fragments	1976-120C-BC											

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R?	Cosmos 881*	1976-121A	1976 Dec 15.07 <0.93 day 1976 Dec 15	-	-	1976 Dec 15.4	51.60	88.75	6594	198	233	0.003	151
D R?	Cosmos 882*	1976-121B	1976 Dec 15.07 <0.93 day 1976 Dec 15	-	-	1976 Dec 15.4	51.60	88.46	6579	189	213	0.002	204
D	Cosmos 881 rocket	1976-121C	1976 Dec 15.07 5 days 1976 Dec 20	Cylinder 4000?	12 long? 4 dia	1976 Dec 15.4	51.60	88.46	6579	189	213	0.002	204
D	Fragments	1976-121D-F											
	Cosmos 883	1976-122A	1976 Dec 15.58 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1976 Dec 16.2	82.95	104.86	7365	961	1012	0.003	291
	Cosmos 883 rocket	1976-122B	1976 Dec 15.58 600 years	Cylinder 2200?	7.4 long 2.4 dia	1976 Dec 17.0	82.95	104.74	7359	961	1000	0.003	287
D	Cosmos 884	1976-123A	1976 Dec 17.40	Sphere-cylinder 6300?	6.5 long?	1976 Dec 17.7	65.05	89.63	6635	169	345	0.013	67
R			11.87 days 1976 Dec 29.27		2.4 dia	1976 Dec 18.6	65.01	89.34	6621	166	319	0.012	74
D	Cosmos 884 rocket	1976-123B	1976 Dec 17.40 6 days 1976 Dec 23	Cylinder 2500?	7.5 long 2.6 dia	1976 Dec 17.8	65.02	89.50	6629	171	330	0.012	67
D	Cosmos 884 engine	1976-123F	1976 Dec 17.40 17 days 1977 Jan 3	Cone 600? full	1.5 long? 2 dia?	1976 Dec 30.6	65.05	88.98	6603	159	291	0.010	65
D	Fragments	1976-123C-E											

* Probably manned-related

Year of launch 1976 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 885 †	1976-124A	1976 Dec 17.50 1031 days 1979 Oct 14	Cylinder?	4 long? 2 dia?	1976 Dec 20.6	65.84	94.40	6868	467	512	0.003	341
D	Cosmos 885 rocket	1976-124B	1976 Dec 17.50 992 days 1979 Sep 5	Cylinder 2200?	7.4 long 2.4 dia	1976 Dec 20.6	65.85	94.26	6861	457	508	0.004	353
D	Fragments	1976-124C-U											
D	[Titan 3D]*	1976-125A	1976 Dec 19.77 770 days 1979 Jan 28	Cylinder 13300? full	15 long 3.0 dia	1976 Dec 22.8 1976 Dec 23.8 1977 Mar 27.5	96.95 96.94 96.93	92.37 93.37 92.51	6768 6816 6775	247 341 264	533 535 530	0.021 0.014 0.020	159 149 164
D	Capsule?	1976-125B	1976 Dec 19.77 141 days 1977 May 9	-	-	1976 Dec 21.1	96.93	92.26	6763	248	521	0.020	165
D	Titan 3D rocket	1976-125C	1976 Dec 19.77 66 days 1977 Feb 23	Cylinder 1900	6 long 3.0 dia	1977 Jan 1.0	96.94	91.56	6728	254	445	0.014	-
D	Capsule?	1976-125D	1976 Dec 19.77 52 days 1977 Feb 9	-	-	1976 Dec 21.2	97.01	92.46	6773	256	533	0.021	161
	Cosmos 886**	1976-126A	1976 Dec 27.53 disintegrated	Cylinder?	4 long? 2 dia?	1976 Dec 27.6 1976 Dec 27.8	65.85 65.84	102.96 114.79	7276 7823	531 594	1265 2295	0.050 0.109	81 57
D	Cosmos 886 rocket	1976-126B	1976 Dec 27.53 3 days 1976 Dec 30	Cylinder 1500?	8 long? 2.5 dia?	1976 Dec 29.8	62.74	91.56	6730	132	571	0.033	50
3d	Fragments	1976-126C-BJ											

† Cosmos 885 disintegrated during Mar-Apr 1977

* Titan 3D manoeuvred on 1976 Dec 23.78; also between 1977 Mar 25.32 and Mar 25.83; also during 1978 June

** Cosmos 886 passed close to Cosmos 880 on 1976 Dec 27.6, and exploded later into 20 to 50 fragments.

Year of launch 1976 concluded

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Molniya 3F	1976-127A	1976 Dec 28.28 10 years	Windmill + 6 vanes 1500?	4.2 long? 1.6 dia	1977 Jan 3.9	62.81	716.97	26537	544	39773	0.739	288
D	Molniya 3F launcher	1976-127B	1976 Dec 28.28 78 days 1977 Mar 16	Irregular	-	1977 Jan 3.9	62.83	92.44	6773	217	573	0.026	121
D	Molniya 3F launcher rocket	1976-127C	1976 Dec 28.28 49 days 1977 Feb 15	Cylinder 2500?	7.5 long 2.6 dia	1977 Jan 4.9	62.84	92.30	6766	192	584	0.029	118
	Molniya 3F rocket	1976-127E	1976 Dec 28.28 10 years	Cylinder 440	2.0 long 2.0 dia	1977 Jan 3.4	62.90	732.48	26918	613	40466	0.740	288
D	Fragment	1976-127D											
	Cosmos 887	1976-128A	1976 Dec 28.32 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1977 Jan 5.0	82.94	104.84	7364	954	1018	0.004	277
	Cosmos 887 rocket	1976-128B	1976 Dec 28.32 600 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Jan 1.1	82.94	104.72	7359	953	1008	0.004	286

TABLE OF ARTIFICIAL EARTH SATELLITES

Year of launch 1977

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 888	1977-01A	1977 Jan 6.41	Sphere-cylinder	6.5 long?	1977 Jan 6.6	64.97	89.45	6626	170	325	0.012	68
R			12.85 days	6300?	2.4 dia	1977 Jan 16.7	64.97	89.40	6623	168	322	0.012	63
			1977 Jan 19.26										
D	Cosmos 888 rocket	1977-01B	1977 Jan 6.41	Cylinder	7.5 long	1977 Jan 6.8	64.99	89.30	6618	168	312	0.011	68
			5 days	2500?	2.6 dia								
			1977 Jan 11										
D	Cosmos 888 engine	1977-01D	1977 Jan 6.41	Cone	1.5 long?	Orbit similar to 1977-01A							
			17 days	600? full	2 dia?								
			1977 Jan 23										
D	Fragments	1977-01C,E,F											
	Meteor 2-02	1977-02A	1977 Jan 6.97	Cylinder + 2 vanes	5 long?	1977 Jan 10.6	81.27	102.97	7276	890	906	0.001	56
			500 years	2750?	1.5 dia?								
	Meteor 2-02 rocket	1977-02B	1977 Jan 6.97	Cylinder	3.8 long	1977 Jan 13.5	81.28	103.05	7280	862	942	0.005	154
			400 years	1440	2.6 dia								
	Fragments	1977-02C, D											
D	Cosmos 889	1977-03A	1977 Jan 20.36	Sphere-cylinder	5.0 long	1977 Jan 21.4	71.38	89.84	6644	202	329	0.010	60
R			11.92 days	5700?	2.4 dia								
			1977 Feb 1.28										
D	Cosmos 889 rocket	1977-03B	1977 Jan 20.36	Cylinder	7.5 long	1977 Jan 21.5	71.38	89.56	6630	203	300	0.007	57
			12 days	2500?	2.6 dia								
			1977 Feb 1										

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 890	1977-04A	1977 Jan 20.84 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1977 Jan 21.1	82.96	105.17	7380	983	1020	0.003	265
	Cosmos 890 rocket	1977-04B	1977 Jan 20.84 600 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Jan 23.2	82.96	105.05	7374	982	1009	0.002	249
T	NATO 3B	1977-05A	1977 Jan 28.03 > million years	Cylinder 701 full 340 empty	2.23 long 2.2 dia	1977 Jan 28.1 1977 Jul 1.0	27.00 2.6	633.41 1436.2	24431 42167	184 35784	35922 35794	0.731 0.0001	183 -
	NATO 3B second stage	1977-05B	1977 Jan 28.03 200 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1977 Jan 30.8	28.01	104.09	7338	618	1301	0.047	85
	NATO 3B third stage	1977-05C	1977 Jan 28.03 3½ years	Sphere-cone 66	1.32 long 0.94 dia	1977 Feb 21.3	26.94	627.06	24269	145	35637	0.731	198*
	Fragments	1977-05D-F											
	Cosmos 891	1977-06A	1977 Feb 2.52 4 years	Cylinder?	4 long? 2 dia?	1977 Feb 10.6	65.84	94.49	6873	473	516	0.003	348
D	Cosmos 891 rocket	1977-06B	1977 Feb 2.52 1049 days 1979 Dec 18	Cylinder 2200?	7.4 long 2.4 dia	1977 Feb 14.9	65.84	94.41	6868	464	516	0.004	354

* Approximate orbit

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	[Titan 3C] †	1977-07A	1977 Feb 6 > million years	-	-	1977 Feb 7.5 1977 Mar 1.0	26.3 0.5	633.0 1433.3	24445 42118	295 35620	35840 35860	0.727 0.003	180 -
D	Titan 3C second stage	1977-07B	1977 Feb 6 < 1 day 1977 Feb 6	Cylinder 1900	6 long 3.0 dia	Orbit similar to 1976-59B							
	Transtage	1977-07C	1977 Feb 6 > million years	Cylinder 1500?	6 long? 3.0 dia	Orbits similar to 1977-07A							
	Fragment	1977-07D											
D 2M R	Soyuz 24*	1977-08A	1977 Feb 7.68 17.7 days 1977 Feb 25.4	Sphere-cylinder 6570?	7.5 long 2.3 dia	1977 Feb 7.9 1977 Feb 8.4 1977 Feb 12.3	51.62 51.57 51.58	89.40 89.25 89.53	6626 6619 6633	173 217 251	323 264 258	0.011 0.004 0.001	99 60 89
D	Soyuz 24 rocket	1977-08B	1977 Feb 7.68 5 days 1977 Feb 12	Cylinder 2500?	7.5 long 2.6 dia	1977 Feb 8.7	51.62	89.24	6618	168	312	0.011	99
D	Fragment	1977-08C											
D R	Cosmos 892	1977-09A	1977 Feb 9.48 12.7 days 1977 Feb 22.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1977 Feb 10.1 1977 Feb 11.2	72.86 72.86	90.40 89.66	6671 6635	159 171	427 343	0.020 0.013	89 72
D	Cosmos 892 rocket	1977-09B	1977 Feb 9.48 6 days 1977 Feb 15	Cylinder 2500?	7.5 long 2.6 dia	1977 Feb 10.1	72.86	90.22	6662	156	412	0.019	90
D	Cosmos 892 engine**	1977-09D	1977 Feb 9.48 17 days 1977 Feb 26	Cone 600? full	1.5 long? 2 dia?	1977 Feb 22.2	72.86	89.40	6622	166	322	0.012	41
D	Fragments	1977-09C,E-G											

† Early Warning Satellite; approximate orbits.

* Soyuz 24 docked with Salyut 5 about 1977 Feb 8.80; undocked 1977 Feb 25.

** Jettisoned from 1977-09A about 1977 Feb 21.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Molniya 2S	1977-10A	1977 Feb 11.63 20 years	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia	1977 Feb 14.2 1977 May 1.0	62.81 62.9	735.35 717.67	26988 26554	464 498	40756 39853	0.746 0.741	280 -
D	Molniya 2S launcher	1977-10B	1977 Feb 11.63 30 days 1977 Mar 13	Irregular	-	1977 Feb 14.0	62.84	91.02	6704	206	445	0.018	129
D	Molniya 2S launcher rocket	1977-10C	1977 Feb 11.63 19 days 1977 Mar 2	Cylinder 2500?	7.5 long 2.6 dia	1977 Feb 13.5	62.82	91.03	6704	184	468	0.021	123
	Molniya 2S rocket	1977-10E	1977 Feb 11.63 20 years	Cylinder 440	2.0 long 2.0 dia	1977 Feb 23.4	62.79	731.23	26887	493	40525	0.745	280
D	Fragment	1977-10D											
	Cosmos 893 (+ rocket)	1977-11A	1977 Feb 15.46 5 years	Cylinder + ellipsoid 2750?	9.2 long? 1.5 and 2.4 dia	1977 Feb 20.6	74.00	105.25	7384	332	1680	0.091	60
D	Fragments	1977-11B,C											
T	Tansei 3* [Mu-3H]	1977-12A	1977 Feb 19.22 2000 years	Polyhedral cylinder? 134	1 long? 1 dia?	1977 Feb 19.3	65.76	134.30	8687	796	3821	0.174	337
D	Tansei 3 rocket	1977-12B	1977 Feb 19.22 760 days 1979 Mar 21	Sphere-cone? 230?	2.33 long? 1.14 dia?	1977 Feb 21.5	65.50	95.87	6939	329	793	0.033	152
1d	Fragments	1977-12C-G											

* Japanese spacecraft launched by improved version of Mu-3C booster.

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 894	1977-13A	1977 Feb 21.72 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1977 Feb 24.5	82.94	105.00	7371	972	1014	0.003	273
	Cosmos 894 rocket	1977-13B	1977 Feb 21.72 600 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Feb 26.7	82.93	104.89	7366	971	1004	0.002	260
T	Kiku 2* (ETS 2)	1977-14A	1977 Feb 23.37 > million years	Polyhedral cylinder? 130 empty	1.4 long? 1.8 dia?	1977 Feb 23.6 1977 Mar 5.0	23.95 0.3	627 1435.9	24259 42161	186 35775	35576 35791	0.729 0.0002	176 -
	Kiku 2 rocket [Nu]	1977-14B	1977 Feb 23.37 10 years	Cylinder 66?	1.7 long 1.6 dia	1977 May 1.0	23.5	627.5	24277	221	35577	0.728	-
	Cosmos 895	1977-15A	1977 Feb 26.89 60 years	Cylinder + 2 vanes? 2500?	5 long? 1.5 dia?	1977 Feb 27.5	81.19	97.19	7001	611	635	0.002	192
	Cosmos 895 rocket	1977-15B	1977 Feb 26.89 60 years	Cylinder 1440	3.8 long 2.6 dia	1977 Feb 27.6	81.20	97.27	7005	574	680	0.008	181
D R	Cosmos 896	1977-16A	1977 Mar 3.44 12.8 days 1977 Mar 16.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1977 Mar 4.4 1977 Mar 6.9	72.87 72.89	88.56 89.72	6580 6638	195 177	209 343	0.001 0.012	307 226
D	Cosmos 896 rocket	1977-16B	1977 Mar 3.44 1 day 1977 Mar 4	Cylinder 2500?	7.5 long 2.6 dia	1977 Mar 3.7	72.88	88.24	6564	169	203	0.003	295

* Japanese Engineering Test Satellite; first orbit is approximate.

1977-16 continued on page 481

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 896 engine	1977-16C	1977 Mar 3.44 22 days 1977 Mar 25	Cone 600? full	1.5 long? 2 dia?	1977 Mar 15.9	72.92	89.50	6627	160	338	0.013	197
D	Fragments	1977-16D-H											
D R	Cosmos 897	1977-17A	1977 Mar 10.46 12.79 days 1977 Mar 23.25	Sphere-cylinder 5900?	5.9 long? 2.4 dia	1977 Mar 11.3	72.85	89.63	6634	171	340	0.013	83
D	Cosmos 897 rocket	1977-17B	1977 Mar 10.46 4.71 days 1977 Mar 15.17	Cylinder 2500?	7.5 long 2.6 dia	1977 Mar 11.2	72.85	89.41	6623	169	320	0.011	80
D	Capsule?†	1977-17C	1977 Mar 10.46 21 days 1977 Mar 31	Ellipsoid 200?	0.9 long 1.9 dia	1977 Mar 23.3	72.84	90.17	6661	172	393	0.017	56
D	Fragments	1977-17D-G											
T	Palapa 2*	1977-18A	1977 Mar 10.97 > million years	Cylinder 574 full 293 empty	1.56 long 1.90 dia	1977 Mar 11.0 1977 May 1.0	24.66 0.1	645.57 1436.1	24743 42165	231 35764	36499 35809	0.733 0.0005	179 -
D	Palapa 2 second stage	1977-18C	1977 Mar 10.97 282 days 1977 Dec 17	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1977 Mar 11.0	28.66	117.54	7948	188	2953	0.174	82
	Palapa 2 third stage	1977-18B	1977 Mar 10.97 30 years	Sphere-cone 66	1.32 long 0.94 dia	1977 Mar 27.3	24.65	640.57	24630	247	36256	0.731	190
D	Fragments	1977-18D,E											

* Indonesian satellite launched by NASA.

† Possibly an engine

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Titan 3B Agena D]	1977-19A	1977 Mar 13.78 74 days 1977 May 26	Cylinder 3000?	8 long? 1.5 dia	1977 Mar 15.5	96.40	89.25	6614	124	348	0.017	144
D	Fragment	1977-19B											
D R	Cosmos 898	1977-20A	1977 Mar 17.36 12.8 days 1977 Mar 30.2	Sphere-cylinder 5900?	5.9 long 2.4 dia	1977 Mar 18.9	81.35	88.99	6601	216	230	0.001	88
D	Cosmos 898 rocket	1977-20B	1977 Mar 17.36 5 days 1977 Mar 22	Cylinder 2500?	7.5 long 2.6 dia	1977 Mar 18.5	81.35	88.87	6595	214	220	0.0005	167
D	Capsule	1977-20D	1977 Mar 17.36 17 days 1977 Apr 3	Ellipsoid 200?	0.9 long 1.9 dia	1977 Mar 28.0	81.34	88.80	6592	210	217	0.0006	62
D	Fragment	1977-20C											
	Molniya 1AM	1977-21A	1977 Mar 24.50 20 years	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1977 Mar 24.5 1977 Apr 22.1	62.77 62.87	736.36 717.49	27013 26550	458 465	40812 39879	0.747 0.742	280 280
D	Molniya 1AM launcher	1977-21B	1977 Mar 24.50 26 days 1977 Apr 19	Irregular	-	1977 Mar 25.6	62.83	91.01	6703	211	439	0.017	131
D	Molniya 1AM launcher rocket	1977-21C	1977 Mar 24.50 19 days 1977 Apr 12	Cylinder 2500?	7.5 long 2.6 dia	1977 Mar 25.6	62.82	91.07	6706	192	464	0.020	121
	Molniya 1AM rocket	1977-21D	1977 Mar 24.50 20 years	Cylinder 440	2.0 long 2.0 dia	1977 Apr 17.5	62.83	732.89	26928	440	40659	0.747	280

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 899	1977-22A	1977 Mar 24.93 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1977 Mar 25.6	74.05	95.15	6903	503	547	0.003	344
	Cosmos 899 rocket	1977-22B	1977 Mar 24.93 10 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Mar 27.6	74.05	95.03	6897	493	545	0.004	347
D	Fragment	1977-22C											
D	Cosmos 900*	1977-23A	1977 Mar 29.96 926 days 1979 Oct 11	- 900?	-	1977 Mar 30.3	82.95	94.43	6868	457	522	0.005	343
D	Cosmos 900 rocket	1977-23B	1977 Mar 29.96 891 days 1979 Sep 6	Cylinder 2200?	7.4 long 2.4 dia	1977 Apr 4.3	82.95	94.31	6862	448	519	0.005	331
	Meteor 27	1977-24A	1977 Apr 5.09 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1977 Apr 6.5	81.25	102.50	7254	854	897	0.003	280
	Meteor 27 rocket	1977-24B	1977 Apr 5.09 400 years	Cylinder 1440	3.8 long 2.6 dia	1977 Apr 6.4	81.26	102.64	7261	842	923	0.006	200
	Fragment	1977-24C											
D	Cosmos 901	1977-25A	1977 Apr 5.44 449 days 1978 June 28	Ellipsoid 400?	1.8 long 1.2 dia	1977 Apr 6.4	70.99	95.54	6923	269	820	0.040	84
D	Cosmos 901 rocket	1977-25B	1977 Apr 5.44 354 days 1978 Mar 25	Cylinder 1500?	8 long 1.65 dia	1977 Apr 7.5	70.98	95.38	6915	273	800	0.038	84

* Included Czech and East German ionospheric and magnetospheric experiments.

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 902	1977-26A	1977 Apr 7.38	Sphere-cylinder	6.5 long?	1977 Apr 8.2	81.39	89.00	6602	168	279	0.008	77
R			12.85 days	6300?	2.4 dia	1977 Apr 17.2	81.39	89.12	6608	172	287	0.009	43
			1977 Apr 20.23										
D	Cosmos 902 rocket	1977-26B	1977 Apr 7.38	Cylinder	7.5 long	1977 Apr 7.9	81.39	88.78	6591	167	258	0.007	79
			2 days	2500?	2.6 dia								
			1977 Apr 9										
D	Cosmos 902 engine*	1977-26E	1977 Apr 7.38	Cone	1.5 long?	1977 Apr 19.8	81.39	88.95	6599	159	283	0.009	32
			16 days	600? full	2 dia?								
			1977 Apr 23										
D	Fragments	1977-26C,D											
	Cosmos 903	1977-27A	1977 Apr 11.07	Windmill +	4.2 long?	1977 Apr 12.6	62.84	725.88	26756	603	40153	0.739	318
			100 years?	6 vanes?	1.6 dia?	1977 Apr 16.2	62.83	717.87	26558	597	39763	0.737	318
				1250?									
D	Cosmos 903 launcher	1977-27B	1977 Apr 11.07	Irregular	-	1977 Apr 12.0	62.82	92.40	6771	213	573	0.027	121
			56 days										
			1977 Jun 6										
D	Cosmos 903 launcher rocket	1977-27C	1977 Apr 11.07	Cylinder	7.5 long	1977 Apr 11.5	62.86	92.47	6775	176	617	0.033	116
			20 days	2500?	2.6 dia								
			1977 May 1										
	Cosmos 903 rocket	1977-27D	1977 Apr 11.07	Cylinder	2.0 long	1977 Apr 16.1	62.83	724.02	26710	610	40053	0.738	318
			100 years?	440	2.0 dia								
	Fragment	1977-27E											
D	Cosmos 904	1977-28A	1977 Apr 20.38	Sphere-cylinder	5.0 long	1977 Apr 21.5	71.37	89.83	6644	203	328	0.009	60
R			13.9 days	5700?	2.4 dia								
			1977 May 4.3										

* 1977-26E jettisoned from 1977-26A about 1977 Apr 19.

1977-28 continued on page 485

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 904 rocket	1977-28B	1977 Apr 20.38 9.5 days 1977 Apr 29.9	Cylinder 2500?	7.5 long 2.6 dia	1977 Apr 21.9	71.38	89.66	6635	198	316	0.009	56
D	Fragment	1977-28C											
T	ESA-GEOS 1*	1977-29A	1977 Apr 20.43 100000 years	Cylinder 573 full 273 empty	1.10 long 1.62 dia	1977 Apr 21.6 1977 Apr 25.4	26.07 26.25	226.82 720.06	12340 26612	238 2110	11685 38357	0.464 0.681	180 179
D	ESA-GEOS 1 second stage	1977-29B	1977 Apr 20.43 <0.57 day 1977 Apr 20	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1977 Apr 20.4	28.73	88.49	6578	165	234	0.005	5
	ESA-GEOS 1 third stage	1977-29C	1977 Apr 20.43 20 years	Sphere-cone 66	1.32 long 0.94 dia	1977 Apr 21.6	26.05	226.80	12339	238	11683	0.464	186
D	Fragment	1977-29D											
D	Cosmos 905	1977-30A	1977 Apr 26.62 29.5 days 1977 May 26.1	Sphere-cylinder 6700?	7 long? 2.4 dia	1977 Apr 26.9 1977 May 4.3 1977 May 10.2	67.12 67.12 67.12	89.60 90.33 89.62	6633 6670 6634	171 170 178	339 413 334	0.013 0.018 0.012	63 61 62
D	Cosmos 905 rocket	1977-30B	1977 Apr 26.62 5 days 1977 May 1	Cylinder 2500?	7.5 long 2.6 dia	1977 Apr 26.9	67.12	89.54	6630	168	336	0.013	63
D	Cosmos 905 engine	1977-30D	1977 Apr 26.62 30 days 1977 May 26	Cone 600? full	1.5 long? 2 dia?	Orbit similar to 1977-30A third orbit							
D	Fragment	1977-30C											

* Intended for 1436 min orbit, but third stage failed to reach nominal transfer orbit apogee.

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 906†	1977-31A	1977 Apr 27.15 3 years	Cylinder + ellipsoid 2750?	9.2 long? 1.5 and 2.4 dia	1977 Apr 29.2	50.65	94.33	6867	463	515	0.004	33
	Molniya 3G	1977-32A	1977 Apr 28.39 20 years	Windmill + 6 vanes 1500?	4.2 long? 1.6 dia	1977 Apr 29.5 1977 Jul 1.0	62.79 62.8	736.03 717.59	27005 26552	436 506	40817 39841	0.748 0.741	280 -
D	Molniya 3G launcher	1977-32B	1977 Apr 28.39 17 days 1977 May 15	Irregular	-	1977 Apr 28.5	62.78	90.46	6675	210	384	0.013	132
D	Molniya 3G launcher rocket	1977-32C	1977 Apr 28.39 17 days 1977 May 15	Cylinder 2500?	7.5 long 2.6 dia	1977 Apr 29.5	62.81	90.84	6694	190	442	0.019	121
	Molniya 3G rocket	1977-32D	1977 Apr 28.39 20 years	Cylinder 440	2.0 long 2.0 dia	Orbit similar to 1977-32A first orbit							
D R	Cosmos 907	1977-33A	1977 May 5.59 10.6 days 1977 May 16.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1977 May 6.5 1977 May 7.2	62.80 62.80	89.93 89.30	6651 6619	181 168	364 313	0.014 0.011	86 67
D	Cosmos 907 rocket	1977-33B	1977 May 5.59 8 days 1977 May 13	Cylinder 2500?	7.5 long 2.6 dia	1977 May 6.5	62.79	89.76	6642	179	349	0.013	83
D	Cosmos 907 engine*	1977-33G	1977 May 5.59 19 days 1977 May 24	Cone 600? full	1.5 long? 2 dia?	1977 May 21.0	62.80	88.80	6594	161	270	0.008	-
D	Fragments	1977-33C-F											

*Jettisoned from 1977-33A about 1977 May 15

†With rocket attached

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	DSCS 7 [Titan 3C]	1977-34A	1977 May 12.61 > million years	Cylinder + 2 dishes 565	1.83 long 2.74 dia	1977 May 21.3	2.44	1426.7	41978	35438	35762	0.004	353
T	DSCS 8	1977-34B	1977 May 12.61 > million years	Cylinder + 2 dishes 565	1.83 long 2.74 dia	1977 May 24.1	2.43	1436.1	42165	35781	35792	0.0001	212
	Transtage	1977-34C	1977 May 12.61 > million years	Cylinder 1500?	6 long? 3.0 dia	1977 May 12.7 1977 May 13.0 1977 May 24.9	28.60 26.63 2.35	88.89 635.9 1507.1	6606 24492 43545	153 285 35762	302 35943 38572	0.011 0.728 0.032	117 - 188
D	Titan 3C second stage	1977-34D	1977 May 12.61 2 days 1977 May 14	Cylinder 1900	6 long 3.0 dia	1977 May 13.4	28.56	88.43	6583	149	260	0.008	124
D R	Cosmos 908	1977-35A	1977 May 17.43 13.83 days 1977 May 31.26	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1977 May 18.5	51.79	89.06	6609	174	288	0.009	84
D	Cosmos 908 rocket	1977-35B	1977 May 17.43 4 days 1977 May 21	Cylinder 2500?	7.5 long 2.6 dia	1977 May 17.7	51.79	89.02	6607	174	284	0.008	88
D	Fragments *	1977-35C,D											
	Cosmos 909	1977-36A	1977 May 19.69 4000 years	Cylinder?	4 long? 2 dia?	1977 May 22.4	65.87	117.07	7928	990	2109	0.071	165
	Cosmos 909 rocket	1977-36B	1977 May 19.69 2000 years	Cylinder 2200?	7.4 long 2.4 dia	1977 May 28.8	65.87	116.94	7922	987	2100	0.070	162
	Fragment	1977-36C											

*Object 1977-35D is probably Cosmos 908 engine; it decayed 1977 June 3, life 17 days

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 910	1977-37A	1977 May 23.52 0.05 day 1977 May 23.57	Cylinder?	4 long? 2 dia?	1977 May 23.6	65.86?	99.56?	7115?	[-300?]	1774?	0.146?	217?*
D •	Cosmos 910 rocket	1977-37B	1977 May 23.52 4 days 1977 May 27	Cylinder 1500?	8 long? 2.5 dia?	1977 May 23.6	65.10	90.56	6681	141	485	0.024	46
D	Fragment	1977-37C											
T	[Atlas Agena D]	1977-38A	1977 May 23.6? >million years	Cylinder 700? full 350? empty	1.7 long? 1.4 dia?	1977 May 24.0 1977 Jun 1.0	28.2 0.2	733.2 1435.1	26975 42145	191 35679	41002 35855	0.756 0.002	-** -**
	Agena D rocket	1977-38B	1977 May 23.6? 10 years?	Cylinder 700	6 long? 1.5 dia	1977 May 24.0	28.2	733.2	26975	191	41002	0.756	-**
	Cosmos 911	1977-39A	1977 May 25.46 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1977 May 26.1	82.95	104.87	7365	970	1004	0.002	278
	Cosmos 911 rocket	1977-39B	1977 May 25.46 600 years	Cylinder 2200?	7.4 long 2.4 dia	1977 May 28.9	82.95	104.73	7358	966	994	0.002	245
D R	Cosmos 912	1977-40A	1977 May 26.30 12.8 days 1977 Jun 8.1	Sphere-cylinder 5900?	5.9 long 2.4 dia	1977 May 26.8	81.35	89.00	6602	217	231	0.001	48
D	Cosmos 912 rocket	1977-40B	1977 May 26.30 5 days 1977 May 31	Cylinder 2500?	7.5 long 2.6 dia	1977 May 26.9	81.37	88.89	6597	210	227	0.001	21
D	Capsule	1977-40E	1977 May 26.30 23 days 1977 Jun 18	Ellipsoid 200?	0.9 long 1.9 dia	1977 Jun 12.0	81.40	88.80	6592	207	221	0.001	-
D	Fragments	1977-40C,D											

*Orbit unconfirmed. Cosmos 910 was probably intended to pass close to Cosmos 909 about 1977 May 23.55; it then re-entered. Since it failed to complete one revolution, it is, strictly, not a satellite. **Approximate orbit.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Intelsat 4A (F-4)	1977-41A	1977 May 26.91 >million years	Cylinder 1500 full 795 empty	2.82 long 2.39 dia	1977 May 26.9 1977 May 29.9 1977 Dec 31.9	21.84 0.28 0.1	640.23 1424.2 1436.2	24607 41929 42166	550 35346 35783	35907 35755 35793	0.718 0.005 0.0001	179 - -
	Intelsat 4A (F-4) rocket	1977-41B	1977 May 26.91 6000 years	Cylinder 1815	8.6 long 3.0 dia	1977 Jul 1.0	21.82	649.9	24854	603	36348	0.719	-
D	Cosmos 913	1977-42A	1977 May 30.94 943 days 1979 Dec 29	Octagonal ellipsoid? 550?	1.8 long? 1.5 dia?	1977 May 31.5	74.04	94.55	6874	472	520	0.004	335
D	Cosmos 913 rocket	1977-42B	1977 May 30.94 886 days 1979 Nov 2	Cylinder 2200?	7.4 long 2.4 dia	1977 May 31.6	74.05	94.41	6867	462	516	0.004	345
D	Fragments	1977-42C-X											
D R	Cosmos 914	1977-43A	1977 May 31.32 12.9 days 1977 Jun 13.2	Sphere-cylinder 5900?	5.9 long 2.4 dia	1977 Jun 1.2	65.00	89.59	6633	203	306	0.008	64
D	Cosmos 914 rocket	1977-43B	1977 May 31.32 11 days 1977 Jun 11	Cylinder 2500?	7.5 long 2.6 dia	1977 May 31.4	65.00	89.59	6633	167	342	0.013	54
D	Capsule	1977-43E	1977 May 31.32 32 days 1977 Jul 2	Ellipsoid 200?	0.9 long 1.9 dia	1977 Jul 1.0	64.99	87.59	6534	150	162	0.001	-
D	Fragments	1977-43C,D											

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	AMS 2 [Thor Burner 2]	1977-44A	1977 Jun 5.13 80 years	Irregular 450	6.40 long 1.68 dia	1977 Jun 5.2	99.20	101.74	7218	811	869	0.004	212
	Burner 2 rocket	1977-44B	1977 Jun 5.13 60 years	Sphere-cone 66	1.32 long 0.94 dia	1977 Jun 7.4	99.21	101.57	7209	799	863	0.004	207
	Fragments	1977-44C,D											
D	Cosmos 915	1977-45A	1977 Jun 8.59 12.6 days 1977 Jun 21.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1977 Jun 9.4	62.80	89.10	6609	173	289	0.009	58
R						1977 Jun 9.6	62.81	89.32	6620	177	307	0.010	63
D	Cosmos 915 rocket	1977-45B	1977 Jun 8.59 3 days 1977 Jun 11	Cylinder 2500?	7.5 long 2.6 dia	1977 Jun 8.8	62.79	89.02	6605	173	281	0.008	55
D	Cosmos 915 engine*	1977-45C	1977 Jun 8.59 17 days 1977 Jun 25	Cone 600? full	1.5 long? 2 dia?	1977 Jun 20.4	62.78	89.12	6610	172	292	0.009	61
D	Fragments	1977-45D,E											
D	Cosmos 916	1977-46A	1977 Jun 10.34 11.61 days 1977 Jun 21.95	Sphere-cylinder 5900?	5.9 long 2.4 dia	1977 Jun 11.3	62.80	89.94	6650	246	298	0.004	168
R													
D	Cosmos 916 rocket	1977-46B	1977 Jun 10.34 21 days 1977 Jul 1	Cylinder 2500?	7.5 long 2.6 dia	1977 Jun 11.9	62.79	89.86	6646	241	295	0.004	172
D	Capsule**	1977-46G	1977 Jun 10.34 21 days 1977 Jul 1	Ellipsoid 200?	0.9 long 1.9 dia	1977 Jun 22.7	62.81	89.83	6645	247	286	0.003	173
D	Fragments	1977-46C-F											

* Jettisoned from Cosmos 915 about 1977 Jun 20

** Ejected from Cosmos 916 about 1977 Jun 21

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 917	1977-47A	1977 Jun 16.09 100 years?	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia	1977 Jun 17.1 1977 Jun 21.2	62.91 62.90	726.00 718.74	26759 26580	585 586	40176 39818	0.740 0.738	318 318
D	Cosmos 917 launcher	1977-47B	1977 Jun 16.09 62 days 1977 Aug 17	Irregular	-	1977 Jun 18.1	62.78	92.38	6771	216	569	0.026	119
D	Cosmos 917 launcher rocket	1977-47C	1977 Jun 16.09 28.80 days 1977 Jul 14.89	Cylinder 2500?	7.5 long 2.6 dia	1977 Jun 17.7	62.87	92.25	6764	184	588	0.030	119
	Cosmos 917 rocket	1977-47D	1977 Jun 16.09 100 years?	Cylinder 440	2.0 long 2.0 dia	1977 Jun 21.2	62.85	722.48	26672	587	40001	0.739	318
T	GOES 2	1977-48A	1977 Jun 16.45 > million years	Cylinder + boom. 627 (243 empty)	2.30 long 1.90 dia	1977 Jun 16.5 1977 Jun 21.2	23.85 0.88	652.07 1436.03	24909 42163	201 35266	36861 36304	0.736 0.012	178 144
	GOES 2 second stage	1977-48B	1977 Jun 16.45 200 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1977 Jun 16.5 1977 Jun 18.1	28.40 28.41	94.02 108.83	6849 7557	179 572	763 1786	0.043 0.080	166 78
	GOES 2 third stage	1977-48F	1977 Jun 16.45 10 years?	Sphere-cone 66	1.32 long 0.94 dia	1977 Jun 16.5	23.80	655.93	25007	185	37073	0.738	178
	GOES 2 apogee motor	1977-48G	1977 Jun 16.45 > million years	- 384 full	-	Orbit similar to second 1977-48A orbit							
D	Fragments	1977-48C-E											

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Signe 3*	1977-49A	1977 Jun 17.15 733 days 1979 Jun 20	Cylinder 102	0.75 long? 0.7 dia?	1977 Jun 22.5	50.67	94.33	6867	459	519	0.004	35
	Signe 3 rocket	1977-49B	1977 Jun 17.15 2.6 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Jun 22.0	50.66	94.23	6863	452	518	0.005	25
D	Cosmos 918**	1977-50A	1977 Jun 17.31 1 day 1977 Jun 18	Cylinder?	4 long? 2 dia?	1977 Jun 17.4	65.11	88.18	6564	128	243	0.009	14
D	Cosmos 918 rocket	1977-50B	1977 Jun 17.31 1 day 1977 Jun 18	Cylinder 1500?	8 long? 2.5 dia?	1977 Jun 17.7	65.07	87.70	6540	124	199	0.006	16
D	Cosmos 919	1977-51A	1977 Jun 18.44 436 days 1978 Aug 28	Ellipsoid 400?	1.8 long 1.2 dia	1977 Jun 19.6	71.02	95.56	6924	269	822	0.040	82
D	Cosmos 919 rocket	1977-51B	1977 Jun 18.44 307 days 1978 Apr 21	Cylinder 1500?	8 long 1.65 dia	1977 Jun 18.7	71.02	95.49	6920	270	814	0.039	84
D	Fragments	1977-51C,D											
D	Cosmos 920	1977-52A	1977 Jun 22.34 12.84 days 1977 Jul 5.18	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1977 Jun 23.0 1977 Jun 24.2	64.99 64.99	89.65 89.40	6636 6623	173 170	342 320	0.013 0.011	66 65
R													
D	Cosmos 920 rocket	1977-52B	1977 Jun 22.34 5 days 1977 Jun 27	Cylinder 2500?	7.5 long 2.6 dia	1977 Jun 23.0	65.01	89.52	6629	167	335	0.013	67

* French satellite launched by the USSR (solar interplanetary gamma neutron experiment).

** May have passed close to Cosmos 909.

1977-52 concluded on page 493

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 920 engine*	1977-52C	1977 Jun 22.34 18 days 1977 Jul 10	Cone 600? full	1.5 long? 2 dia?	1977 Jul 4.5	65.00	89.07	6607	168	290	0.009	61
D	Fragments	1977-52D,E											
T L	NTS 2 [Atlas F]	1977-53A	1977 Jun 23.4? 1 million years	Octagon + 2 vanes 431	0.79 long 1.65 dia	1977 Jun 23.4 1977 Jun 27.2 1977 Sep 1.0	63.18 63.28 63.28	351.87 705.18 717.91	16511 26244 26559	160 19545 20181	20106 20187 20181	0.604 0.012 0	158 198 -
	NTS 2 rocket	1977-53B	1977 Jun 23.4? 22 years	Cone-cylinder? 163?	1.85 long? 0.63 to 1.65 dia?	1977 Jun 26.0	63.19	347.67	16377	168	19830	0.600	158
	NTS 2 apogee motor	1977-53C	1977 Jun 23.4? 1 million years	Cylinder -	0.88 long? 0.63 dia?	1977 Jun 26.0	63.32	704.92	26237	19550	20168	0.012	198
	Molniya 1 AN	1977-54A	1977 Jun 24.24 16 years	Windmill+ 6 vanes 1000?	3.4 long 1.6 dia	1977 Jun 28.7 1977 Sep 1.0	62.93 63.1	699.66 717.73	26107 26555	447 457	39011 39896	0.738 0.743	280 -
D	Molniya 1 AN launcher	1977-54B	1977 Jun 24.24 61 days 1977 Aug 24	Irregular	-	1977 Jun 26.1	62.94	91.59	6732	235	472	0.018	62
D	Molniya 1 AN launcher rocket	1977-54C	1977 Jun 24.24 41 days 1977 Aug 4	Cylinder 2500?	7.5 long 2.6 dia	1977 Jun 26.0	62.95	91.48	6726	214	482	0.020	60
	Molniya 1 AN rocket	1977-54D	1977 Jun 24.24 16 years	Cylinder 440	2.0 long 2.0 dia	1977 Jul 18.9	63.00	695.50	26002	459	38789	0.737	280

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 921	1977-55A	1977 Jun 24.44 75 years	- 825?	-	1977 Jun 27.1	75.84	97.96	7038	620	700	0.006	270
	Cosmos 921 rocket	1977-55B	1977 Jun 24.44 70 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Jun 26.5	75.84	97.93	7037	618	700	0.006	272
D	[Titan 3D]	1977-56A	1977 Jun 27.77 179 days 1977 Dec 23	Cylinder 13300? full	15 long 3.0 dia	1977 Jun 28.2	97.02	88.47	6575	155	239	0.006	126
D	Titan 3D rocket	1977-56B	1977 Jun 27.77 2 days 1977 Jun 29	Cylinder 1900	6 long 3.0 dia	1977 Jun 28.2	97.02	88.27	6565	153	221	0.005	118
	Meteor 28*	1977-57A	1977 Jun 29.78 60 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia	1977 Jul 1.1	97.91	97.46	7014	601	670	0.005	17
	Meteor 28 rocket	1977-57B	1977 Jun 29.78 60 years	Cylinder 1440	3.8 long 2.6 dia	1977 Jul 1.1	97.92	97.53	7018	627	652	0.002	284
D	Fragment	1977-57C											
D R	Cosmos 922	1977-58A	1977 Jun 30.59 12.61 days 1977 Jul 13.20	Sphere-cylinder 5700?	5.0 long 2.4 dia	1977 Jun 30.7	62.81	89.53	6630	205	299	0.007	79
D	Cosmos 922 rocket	1977-58B	1977 Jun 30.59 8 days 1977 Jul 8	Cylinder 2500?	7.5 long 2.6 dia	1977 Jun 30.8	62.80	89.46	6627	203	294	0.007	75
D	Fragments	1977-58C,D											

* First Meteor in Sun-synchronous orbit. May be new Meteor series.

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 923	1977-59A	1977 Jul 1.50 120 years	Cylinder + paddles? 750?	2 long? 1 dia?	1977 Jul 4.4	74.05	101.05	7186	799	817	0.001	78
	Cosmos 923 rocket	1977-59B	1977 Jul 1.50 100 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Jul 2.5	74.06	100.93	7180	788	816	0.002	73
	Cosmos 924	1977-60A	1977 Jul 4.93 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1977 Jul 5.6	74.02	95.28	6910	513	550	0.003	353
	Cosmos 924 rocket	1977-60B	1977 Jul 4.93 10 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Jul 10.1	74.03	95.16	6904	502	549	0.003	350
1d	Fragments	1977-60C,D											
	Cosmos 925	1977-61A	1977 Jul 7.31 60 years	Cylinder + 2 vanes? 2500?	5 long? 1.5 dia?	1977 Jul 18.3	81.21	97.16	7000	609	634	0.002	234
	Cosmos 925 rocket	1977-61B	1977 Jul 7.31 60 years	Cylinder 1440	3.8 long 2.6 dia	1977 Jul 21.9	81.22	97.29	7006	578	677	0.007	145
	Cosmos 926	1977-62A	1977 Jul 8.73 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1977 Jul 14.6	82.94	105.13	7377	976	1022	0.003	260
	Cosmos 926 rocket	1977-62B	1977 Jul 8.73 600 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Jul 18.3	82.94	105.01	7372	976	1011	0.002	242

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 927	1977-63A	1977 Jul 12.38	Sphere-cylinder	6.5 long?	1977 Jul 13.7	72.87	89.65	6635	153	361	0.016	77
R			12.8 days	6300?	2.4 dia	1977 Jul 19.3	72.89	89.88	6647	151	386	0.018	59
			1977 Jul 25.2										
D	Cosmos 927 rocket	1977-63B	1977 Jul 12.38	Cylinder	7.5 long	1977 Jul 13.1	72.88	89.81	6643	167	363	0.015	84
			6 days	2500?	2.6 dia								
			1977 Jul 18										
D	Cosmos 927 engine*	1977-63C	1977 Jul 12.38	Cone	1.5 long?	1977 Jul 24.8	72.89	88.83	6594	116	316	0.015	45
			15 days	600? full	2 dia?								
			1977 Jul 27										
D	Fragment	1977-63D											
	Cosmos 928	1977-64A	1977 Jul 13.21	Cylinder	1.3 long?	1977 Jul 16.9	82.96	104.79	7362	956	1011	0.004	287
			1200 years	700?	1.9 dia?								
	Cosmos 928 rocket	1977-64B	1977 Jul 13.21	Cylinder	7.4 long	1977 Jul 15.5	82.96	104.70	7357	958	1000	0.003	284
			600 years	2200?	2.4 dia								
T	Himawari** (GMS 1)	1977-65A	1977 Jul 14.44	Cylinder	3.0 long†	1977 Jul 14.6	27.36	649.66	24844	187	36744	0.736	180
			> million years	670 full	2.1 dia?	1977 Jul 17.6	1.20	1429.43	42033	35531	35779	0.003	98
				281 empty		1977 Nov 1.0	1.0	1436.1	42165	35775	35799	0.0003	-
	Himawari second stage	1977-65B	1977 Jul 14.44	Cylinder + annulus	6.4 long	1977 Jul 14.4	28.68	92.82	6798	172	668	0.037	165
			disintegrated	350?	1.52 and 2.44 dia	1977 Jul 16.6	29.05	111.01	7658	534	2025	0.097	67
	Himawari third stage	1977-65D	1977 Jul 14.44	Sphere-cone	1.32 long	1977 Jul 14.5	27.09	658.10	25062	245	37123	0.736	180
			10 years	66	0.94 dia								
16d	Fragments	1977-65C, E-FF											

* Jettisoned from Cosmos 927 about 1977 Jul 24.

** Japanese Geostationary Meteorological Satellite, launched by NASA, may have ejected an apogee motor.

† Length including antennae.

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 929 †	1977-66A	1977 Jul 17.38 200 days 1978 Feb 2	Cylinder + vanes 19000?	14 long 4.15 to 2.0 dia	1977 Jul 18.6 1977 Aug 26 1977 Dec 19	51.59 51.58 51.58	89.36 90.78 93.38	6624 6693 6821	214 312 438	278 318 447	0.005 0.0005 0.001	88 - -
D	Cosmos 929 rocket	1977-66B	1977 Jul 17.38 12 days 1977 Jul 29	Cylinder 4000?	12 long? 4 dia	1977 Jul 18.6	51.59	89.15	6614	211	260	0.004	83
D	Fragment	1977-66C											
	Cosmos 930*	1977-67A	1977 Jul 19.36 3 years	Cylinder + ellipsoid 2750?	9.2 long? 1.5 and 2.4 dia	1977 Jul 24.3	74.02	94.59	6876	481	514	0.002	354
	Cosmos 931	1977-68A	1977 Jul 20.20 100 years?	Windmill + 6 vanes? 1250?	4.2 long? 1.6 dia?	1977 Jul 22.3	62.96	724.12	26713	604	40065	0.739	318
D	Cosmos 931 launcher	1977-68B	1977 Jul 20.20 64 days 1977 Sep 22	Irregular	-	1977 Jul 23.3	62.81	92.57	6780	212	591	0.028	122
D	Cosmos 931 launcher rocket	1977-68C	1977 Jul 20.20 28 days 1977 Aug 17	Cylinder 2500?	7.5 long 2.6 dia	1977 Jul 23.6	62.85	92.20	6762	182	585	0.030	119
	Cosmos 931 rocket	1977-68D	1977 Jul 20.20 100 years?	Cylinder 440	2.0 long 2.0 dia	1977 Jul 26.8	62.90	720.90	26633	605	39905	0.738	318

* With rocket attached

† De-orbited over Pacific Ocean. Probably a test of engine and airlock modifications for Salyut 6.

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 932	1977-69A	1977 Jul 20.32	Sphere-cylinder	6.5 long?	1977 Jul 22.3	65.02	89.09	6608	149	311	0.012	53
R			12.9 days	6300?	2.4 dia	1977 Jul 25.1	65.02	89.57	6632	150	358	0.016	59
			1977 Aug 2.2										
D	Cosmos 932 rocket	1977-69B	1977 Jul 20.32	Cylinder	7.5 long	1977 Jul 20.5	65.03	89.33	6620	173	311	0.010	64
			4 days	2500?	2.6 dia								
			1977 Jul 24										
D	Cosmos 932 engine*	1977-69D	1977 Jul 20.32	Cone	1.5 long?	1977 Aug 1.6	65.05	88.61	6584	151	261	0.008	65
			14 days	600? full	2 dia?								
			1977 Aug 3										
D	Fragment	1977-69C											
D	Cosmos 933	1977-70A	1977 Jul 22.42	Cylinder	4 long?	1977 Jul 23.6	65.84	92.46	6774	384	408	0.002	343
			467 days		2 dia?								
			1978 Nov 1										
D	Cosmos 933 rocket	1977-70B	1977 Jul 22.42	Cylinder	7.4 long	1977 Jul 23.9	65.85	92.38	6770	376	408	0.002	343
			320 days	2200?	2.4 dia								
			1978 Jun 7										
	Statsionar-Raduga 3	1977-71A	1977 Jul 23.89	-	-	1977 Aug 4.6	0.21	1436.3	42170	35730	35854	0.001	313**
			> million years										
D	Raduga 3 launcher rocket	1977-71B	1977 Jul 23.89	Cylinder	12 long?	1977 Jul 24.1	51.47	88.21	6567	179	198	0.001	286
			3 days	4000?	4 dia								
			1977 Jul 26										
D	Raduga 3 launcher	1977-71C	1977 Jul 23.89	Irregular	-	1977 Jul 24.1	51.46	88.30	6571	191	195	0.0003	32
			3 days										
			1977 Jul 26										
D	Raduga 3 rocket	1977-71D	1977 Jul 23.89	Cylinder	3.9 long?	1977 Aug 16.5	47.2	632.15	24402	290	35758	0.727	6
			317 days	1900?	3.9 dia								
			1978 Jun 5										
D	Fragment	1977-71E											

* Jettisoned from Cosmos 932 about 1977 Aug 1.

** There may be a separated apogee motor in the synchronous orbit.

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 934	1977-72A	1977 Jul 27.76	Sphere-cylinder	6.5 long?	1977 Jul 28.3	62.81	89.35	6621	231	255	0.002	289
R			12.62 days	6300?	2.4 dia	1977 Jul 28.9	62.82	89.60	6634	167	344	0.013	205
			1977 Aug 9.38										
D	Cosmos 934 rocket	1977-72B	1977 Jul 27.76	Cylinder	7.5 long	1977 Jul 28.2	62.79	89.26	6617	223	254	0.002	300
			9 days	2500?	2.6 dia								
			1977 Aug 5										
D	Cosmos 934 engine	1977-72D	1977 Jul 27.76	Cone	1.5 long?	1977 Aug 8.7	62.81	89.50	6629	170	331	0.012	213
			21 days	600? full	2 dia?								
			1977 Aug 17										
D	Fragments	1977-72C,E,F											
D	Cosmos 935	1977-73A	1977 Jul 29.34	Sphere-cylinder	5.0 long	1977 Jul 30.6	81.33	89.20	6612	217	251	0.003	71
R			12.88 days	5700?	2.4 dia								
			1977 Aug 11.22										
D	Cosmos 935 rocket	1977-73B	1977 Jul 29.34	Cylinder	7.5 long	1977 Jul 30.4	81.33	88.92	6598	205	235	0.002	23
			5 days	2500?	2.6 dia								
			1977 Aug 3										
D	Cosmos 936*	1977-74A	1977 Aug 3.59	Sphere-cylinder	5.9 long	1977 Aug 7.4	62.80	90.63	6686	219	396	0.013	112
R			18.55 days	5900?	2.4 dia								
B			1977 Aug 22.14										
D	Cosmos 936 rocket	1977-74B	1977 Aug 3.59	Cylinder	7.5 long	1977 Aug 8.2	62.79	90.35	6671	214	371	0.012	104
			25 days	2500?	2.6 dia								
			1977 Aug 28										

* Satellite with international biological experiments (1977-74 continued on page 500).

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Capsule*	1977-74D	1977 Aug 3.59 66 days 1977 Oct 8	Ellipsoid 200?	0.9 long 1.9 dia	1977 Aug 24.5	62.80	90.40	6673	215	375	0.012	113
D	Fragment	1977-74C											
D	HEAO 1 **	1977-75A	1977 Aug 12.27 580 days 1979 Mar 15	Hexagonal Cylinder 2720	5.8 long 2.4 dia	1977 Aug 12.5	22.76	93.16	6816	428	447	0.001	295
D	HEAO 1 rocket	1977-75B	1977 Aug 12.27 105 days 1977 Nov 25	Cylinder 1815	8.6 long 3.0 dia	1977 Aug 14.5	22.81	91.49	6734	329	383	0.004	240
D	Cosmos 937	1977-77A	1977 Aug 24.30 421 days 1978 Oct 19	Cylinder?	-	1977 Aug 24.4 1977 Aug 29.9	65.05 65.04	92.07 93.31	6751 6812	149 424	597 444	0.033 0.001	64 273
D	Cosmos 937 rocket	1977-77B	1977 Aug 24.30 1 day 1977 Aug 25	Cylinder 1500?	8 long? 2.5 dia?	1977 Aug 24.5	65.01	89.28	6618	100	379	0.021	45
D	Fragment	1977-77C											
D	Cosmos 938	1977-78A	1977 Aug 24.61	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1977 Aug 25.3	62.81	89.70	6639	181	340	0.012	83
R			12.63 days 1977 Sep 6.24			1977 Aug 25.5	62.81	89.37	6622	156	332	0.013	72
D	Cosmos 938 rocket	1977-78B	1977 Aug 24.61 6 days 1977 Aug 30	Cylinder 2500?	7.5 long 2.6 dia	1977 Aug 25.2	62.80	89.49	6628	178	322	0.011	75
D	Cosmos 938† engine	1977-78E	1977 Aug 24.61 14 days 1977 Sep 7	Cone 600? full	1.5 long? 2 dia?	Orbit similar to 1977-78A							
D	Fragments	1977-78C,D,F											

Space Vehicle: Voyager 2 and rockets (1977-76A, 76B and 76C).

** High-Energy Astronomy Observatory.

* Jettisoned from Cosmos 936 about 1977 Aug 22.

† Jettisoned from Cosmos 938 about 1977 Sep 5.

Year of launch 1977 continued

Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
Cosmos 939	1977-79A	1977 Aug 24.76 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1977 Aug 28.8	74.02	114.88	7828	1435	1464	0.002	88
Cosmos 940	1977-79B	1977 Aug 24.76 6000 years	Spheroid 40?	1.0 long? 0.8 dia?	1977 Aug 28.8	74.02	114.46	7809	1397	1464	0.004	82
Cosmos 941	1977-79C	1977 Aug 24.76 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1977 Aug 29.8	74.02	114.67	7818	1416	1464	0.003	92
Cosmos 942	1977-79D	1977 Aug 24.76 10,000 years	Spheroid 40?	1.0 long? 0.8 dia?	1977 Aug 29.8	74.02	115.98	7878	1464	1535	0.004	261
Cosmos 943	1977-79E	1977 Aug 24.76 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1977 Aug 29.5	74.02	115.08	7837	1453	1464	0.001	92
Cosmos 944	1977-79F	1977 Aug 24.76 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1977 Aug 29.6	74.02	115.30	7847	1464	1473	0.001	280
Cosmos 945	1977-79G	1977 Aug 24.76 10,000 years	Spheroid 40?	1.0 long? 0.8 dia?	1977 Aug 28.8	74.02	115.52	7857	1464	1493	0.002	257
Cosmos 946	1977-79H	1977 Aug 24.76 10,000 years	Spheroid 40?	1.0 long? 0.8 dia?	1977 Aug 29.6	74.02	115.73	7866	1464	1512	0.003	269
Cosmos 939 rocket	1977-79J	1977 Aug 24.76 20,000 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Aug 28.0	74.02	117.60	7951	1462	1683	0.014	269

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Sirio 1*	1977-80A	1977 Aug 25.99 >million years	Cylinder + nozzle 220	2 long 1.4 dia	1977 Aug 26.2 1977 Aug 28.6	22.96 0.24	659.92 1417.95	25108 41809	245 33653	37215 37208	0.736 0.043	179 292
	Sirio 1 second stage	1977-80B	1977 Aug 25.99 1600 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1977 Aug 26.0 1977 Aug 26.3	28.10 27.10	99.08 115.30	7093 7853	210 870	1220 2080	0.071 0.077	162 76
	Sirio 1 third stage	1977-80C	1977 Aug 25.99 10 years?	Sphere-cone 66	1.32 long 0.94 dia	Orbit similar to 1977-80A transfer orbit							
D	Fragments	1977-80D,E											
D R	Cosmos 947	1977-81A	1977 Aug 27.43 12.77 days 1977 Sep 9.20	Sphere-cylinder 5700?	5.0 long 2.4 dia	1977 Aug 29.7	72.85	89.75	6640	203	321	0.009	63
D	Cosmos 947 rocket	1977-81B	1977 Aug 27.43 11 days 1977 Sep 7	Cylinder 2500?	7.5 long 2.6 dia	1977 Aug 27.7	72.85	89.67	6636	200	316	0.009	68
D	Fragment	1977-81C											
	Molniya 1AP	1977-82A	1977 Aug 30.76 10¾ years	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1977 Aug 31.8 1977 Sep 13.9	62.83 62.85	735.58 717.77	26993 26556	445 483	40785 39873	0.747 0.742	280 280
D	Molniya 1AP launcher rocket	1977-82B	1977 Aug 30.76 27 days 1977 Sep 26	Cylinder 2500?	7.5 long 2.6 dia	1977 Aug 31.9	62.85	90.94	6700	209	434	0.017	131

* Italian communications satellite, launched by NASA.

1977-82 continued on page 503

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Molniya 1AP launcher	1977-82C	1977 Aug 30.76 24 days 1977 Sep 23	Irregular	-	1977 Aug 31.4	62.84	91.14	6709	198	464	0.020	121
	Molniya 1AP rocket	1977-82E	1977 Aug 30.76 10¾ years	Cylinder 440	2.0 long 2.0 dia	1977 Sep 22.2	62.84	732.08	26908	482	40578	0.745	280
D	Fragment	1977-82D											
D R	Cosmos 948	1977-83A	1977 Sep 2.38 12.84 days 1977 Sep 15.22	Sphere-cylinder 5900?	5.9 long 2.4 dia	1977 Sep 2.9	81.36	89.04	6604	217	235	0.001	62
D	Cosmos 948 rocket	1977-83B	1977 Sep 2.38 5 days 1977 Sep 7	Cylinder 2500?	7.5 long 2.6 dia	1977 Sep 2.6	81.35	88.95	6600	214	229	0.001	46
D	Capsule	1977-83C	1977 Sep 2.38 18 days 1977 Sep 20	Ellipsoid 200?	0.9 long 1.9 dia	Orbit similar to 1977-83A							
D	Fragment	1977-83D											
D R	Cosmos 949*	1977-85A	1977 Sep 6.73 29.5 days 1977 Oct 6.2	Sphere-cylinder 6700?	7 long? 2.4 dia	1977 Sep 7.3 1977 Sep 20.5 1977 Sep 23.5	62.80 62.80 62.80	89.50 89.61 89.89	6629 6635 6649	177 149 177	325 364 364	0.011 0.016 0.014	65 59 83
D	Cosmos 949 rocket	1977-85B	1977 Sep 6.73 5 days 1977 Sep 11	Cylinder 2500?	7.5 long 2.6 dia	1977 Sep 7.3	62.79	89.41	6625	172	321	0.011	60
D	Fragment	1977-85C											

Space Vehicle: Voyager 1 and rockets (1977-84A, 84B and 84C).

* Included manoeuvring engine which was not separately tracked or designated.

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 950	1977-86A	1977 Sep 13.64 13.6 days 1977 Sep 27.2	Sphere-cylinder 5700?	5.0 long 2.4 dia	1977 Sep 14.6	62.81	89.36	6622	205	282	0.006	72
D	Cosmos 950 rocket	1977-86B	1977 Sep 13.64 5 days 1977 Sep 18	Cylinder 2500?	7.5 long 2.6 dia	1977 Sep 14.5	62.80	89.07	6607	197	261	0.005	57
D	Fragment	1977-86C											
T	Cosmos 951	1977-87A	1977 Sep 13.83 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1977 Sep 16.5	82.97	104.98	7371	968	1017	0.003	276
	Cosmos 951 rocket	1977-87B	1977 Sep 13.83 600 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Sep 17.5	82.97	104.88	7366	968	1007	0.003	264
	Cosmos 952*	1977-88A	1977 Sep 16.60 600 years	Cone-cylinder	6 long? 2 dia?	1977 Sep 18.6 1977 Oct 8.7	64.97 64.94	89.65 104.13	6636 7332	251 910	265 998	0.001 0.006	272 267
D	Cosmos 952 rocket	1977-88C	1977 Sep 16.60 25 days 1977 Oct 11	Cylinder 1500?	8 long? 2.5 dia?	1977 Oct 9.6	64.97	89.08	6607	224	233	0.0007	269
D	Cosmos 952 platform	1977-88B	1977 Sep 16.60 52 days 1977 Nov 7	Irregular	-	1977 Oct 14.7	64.97	89.37	6622	235	253	0.001	278

* 1977-88B and 1977-88C attached to 1977-88A until orbit raised on 1977 Oct 8.5

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 953	1977-89A	1977 Sep 16.61	Sphere-cylinder	6.5 long?	1977 Sep 17.2	62.80	89.58	6633	180	330	0.011	77
R			12.6 days	6300?	2.4 dia	1977 Sep 22.2	62.81	89.00	6604	151	300	0.011	65
			1977 Sep 29.2										
D	Cosmos 953 rocket	1977-89B	1977 Sep 16.61	Cylinder	7.5 long	1977 Sep 17.2	62.79	89.43	6626	176	319	0.011	71
			5 days	2500?	2.6 dia								
			1977 Sep 21										
D	Cosmos 953* engine	1977-89C	1977 Sep 16.61	Cone	1.5 long?	1977 Sep 28.4	62.81	89.07	6607	149	309	0.012	86
			14 days	600? full	2 dia?								
			1977 Sep 30										
D	Fragment	1977-89D											
D	Cosmos 954**	1977-90A	1977 Sep 18.58	Cone-cylinder	14 long?	1977 Sep 20.9	64.98	89.65	6636	251	265	0.001	270
P			127.92 days		2.5 dia?	1978 Jan 6.2	64.98	89.27	6617	233	245	0.001	-
			1978 Jan 24.50										
T	Cosmos 955	1977-91A	1977 Sep 20.05	Cylinder + 2 vanes?	5 long?	1977 Sep 25.5	81.24	97.46	7014	630	641	0.001	355
			60 years	2500?	1.5 dia?								
	Cosmos 955 rocket	1977-91B	1977 Sep 20.05	Cylinder	3.8 long	1977 Sep 25.0	81.23	97.55	7019	592	689	0.007	172
			60 years	1440	2.6 dia								
	Fragment	1977-91C											

* Jettisoned from 1977-89A about 1977 Sep 28.

** Manoeuvred until 1977 Nov 1; attitude stabilized until 1978 Jan 6; then lost pressurization and started to tumble, with great increase in drag and rapid decay. Fragments picked up in Canada.

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Statsionar - Ekran 2	1977-92A	1977 Sep 20.73 > million years	Cylinder + plate	-	1977 Sep 21.5	0.40	1426.55	41979	35580	35622	0.0005	28
D	Ekran 2 launcher rocket	1977-92B	1977 Sep 20.73 1 day 1977 Sep 21	Cylinder 4000?	12 long? 4 dia	1977 Sep 21.0	51.45	88.21	6567	184	193	0.0007	291
D	Ekran 2 launcher	1977-92C	1977 Sep 20.73 1 day 1977 Sep 21	Irregular	-	1977 Sep 21.0	51.44	88.22	6567	186	192	0.0005	81
D	Ekran 2 rocket	1977-92E	1977 Sep 20.73 222 days 1978 Apr 30	Cylinder 1900?	3.9 long? 3.9 dia	1977 Oct 26.9	47.18	626.34	24254	242	35510	0.727	10
D	Fragments	1977-92D;F											
T	Prognoz 6	1977-93A	1977 Sep 22.04 22 years	Spheroid + 4 vanes 910	1.8 dia?	1977 Sep 22.0 1977 Sep 22.1	65.04 65.00	91.43 5688	6723 105556	226 488	464 197867	0.018 0.935	70 290
D	Prognoz 6 launcher rocket	1977-93B	1977 Sep 22.04 37 days 1977 Oct 29	Cylinder 2500?	7.5 long 2.6 dia	1977 Sep 23.2	65.04	91.39	6721	226	460	0.017	69
D	Prognoz 6 launcher	1977-93C	1977 Sep 22.04 31 days 1977 Oct 23	Irregular	-	1977 Sep 26.3	65.07	91.31	6717	207	471	0.020	65
	Prognoz 6 rocket	1977-93E	1977 Sep 22.04 22 years	Cylinder 440	2.0 long 2.0 dia	Orbit similar to 1977-93A							
D	Fragment	1977-93D											
D	[Titan 3B Agena D]	1977-94A	1977 Sep 23.78 76 days 1977 Dec 8	Cylinder 3000?	8 long? 1.5 dia	1977 Sep 26.2	96.49	89.30	6617	125	352	0.017	145

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Cosmos 956	1977-95A	1977 Sep 24.43 6 years	- 825?	-	1977 Sep 25.2	75.83	96.89	6987	355	863	0.036	342
	Cosmos 956 rocket	1977-95B	1977 Sep 24.43 5½ years	Cylinder 2200?	7.4 long 2.4 dia	1977 Sep 24.8	75.84	96.84	6985	351	862	0.037	343
D L	Intercosmos 17	1977-96A	1977 Sep 24.69 775 days 1979 Nov 8	Octagonal ellipsoid 550?	1.8 long? 1.5 dia?	1977 Sep 26.4	82.96	94.44	6868	466	514	0.003	344
D	Intercosmos 17 rocket	1977-96B	1977 Sep 24.69 717 days 1979 Sep 11	Cylinder 2200?	7.4 long 2.4 dia	1977 Sep 26.4	82.96	94.36	6864	458	514	0.004	346
D	Fragment	1977-96C											
T	Salyut 6	1977-97A	1977 Sep 29.29 29 months?	Cylinder + 3 vanes 19000?	14 long 4.15 to 2.0 dia	1977 Oct 1.5	51.59	89.14	6613	214	256	0.003	102
D	Salyut 6 rocket	1977-97B	1977 Sep 29.29 6 days 1977 Oct 5	Cylinder 4000?	12 long? 4 dia	1977 Sep 30.1	51.63	88.78	6595	209	225	0.001	79
55d	Fragments	1977-97C-BQ											
D	Cosmos 957	1977-98A	1977 Sep 30.41 12.9 days 1977 Oct 13.3	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1977 Oct 1.3 1977 Oct 2.3	64.97 64.98	89.82 89.51	6644 6629	171 150	361 351	0.014 0.015	66 58
R													
D	Cosmos 957 rocket	1977-98B	1977 Sep 30.41 5.5 days 1977 Oct 5.9	Cylinder 2500?	7.5 long 2.6 dia	1977 Oct 1.3	64.98	89.59	6633	171	338	0.013	62

1977-98 continued on page 508

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 957 engine	1977-98E	1977 Sep 30.41 15 days 1977 Oct 15	Cone 600? full	1.5 long? 2 dia?	1977 Oct 13.9	64.96	88.46	6576	152	244	0.007	51
D	Fragments	1977-98C,D,F											
D	Soyuz 25*	1977-99A	1977 Oct 9.11	Sphere-cylinder 6570?	7.5 long 2.3 dia	1977 Oct 9.3	51.64	88.78	6595	194	240	0.004	73
2M			2.03 days			1977 Oct 9.4	51.60	90.22	6665	265	309	0.003	282
R			1977 Oct 11.14			1977 Oct 10.2	51.62	91.29	6719	329	353	0.002	295
D	Soyuz 25 rocket	1977-99B	1977 Oct 9.11 2 days 1977 Oct 11	Cylinder 2500?	7.5 long 2.6 dia	1977 Oct 9.5	51.64	88.63	6588	189	230	0.003	79
D	Cosmos 958	1977-100A	1977 Oct 11.64	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1977 Oct 11.7	62.81	90.59	6682	257	351	0.007	105
R			12.64 days 1977 Oct 24.28			1977 Oct 15.5	62.81	91.96	6750	323	420	0.007	202
D	Cosmos 958 rocket	1977-100B	1977 Oct 11.64 29 days 1977 Nov 9	Cylinder 2500?	7.5 long 2.6 dia	1977 Oct 12.1	62.79	90.48	6677	255	342	0.006	99
D	Cosmos 958 engine	1977-100E	1977 Oct 11.64 339 days 1978 Sep 15	Cone 600? full	1.5 long? 2 dia?	1977 Oct 25.1 1977 Nov 1.0	62.82 62.81	92.28 92.23	6765 6763	352 352	422 417	0.005 0.005	218
D	Fragments	1977-100C,D,F,G											
D	Cosmos 959	1977-101A	1977 Oct 21.42 40 days 1977 Nov 30	Cylinder?	4 long? 2 dia?	1977 Oct 24.0	65.84	94.57	6876	146	850	0.051	63
D	Cosmos 959 rocket	1977-101B	1977 Oct 21.42 18 days 1977 Nov 8	Cylinder 2200?	7.4 long? 2.4 dia?	1977 Oct 24.1	65.84	94.17	6856	144	812	0.049	63
D	Fragment	1977-101C											

* Soyuz 25 rendezvous with Salyut 6 on 1977 Oct 10.17, but failed to dock

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	ISEE 1*	1977-102A	1977 Oct 22.58 10 years	16-sided Cylinder 340	1.61 long 1.73 dia	1977 Oct 28.0	28.95	3440.9	75499	337	137904	0.911	311
T	ISEE 2	1977-102B	1977 Oct 22.58 10 years	Cylinder + 3 booms 166	1.14 long 1.27 dia	1977 Oct 28.0	28.96	3439.1	75472	341	137847	0.911	311
D	ISEE second stage	1977-102C	1977 Oct 22.58 366 days 1978 Oct 23	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1977 Oct 24.4	28.74	95.68	6937	277	840	0.041	326
	ISEE third stage	1977-102D	1977 Oct 22.58 10 years	Sphere -cone 66	1.32 long 0.94 dia	1977 Oct 22.6	28.76	3552.3	77119	278	141204	0.914	310
T	Cosmos 960	1977-103A	1977 Oct 25.23 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1977 Oct 28.0	74.04	95.13	6902	502	546	0.003	337
	Cosmos 960 rocket	1977-103B	1977 Oct 25.23 10 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Oct 29.4	74.04	95.01	6896	494	542	0.004	348
D	Fragment	1977-103C											
D	Cosmos 961**	1977-104A	1977 Oct 26.22 <0.78 day 1977 Oct 26	Cylinder?	4 long? 2 dia?	1977 Oct 26.2 1977 Oct 26.3	66 66.4	88.76 101.8	6592 7223	125 269	302 1421	0.013 0.080	- -
D	Cosmos 961 rocket	1977-104B	1977 Oct 26.22 1 day 1977 Oct 27	Cylinder 1500?	8 long? 2.5 dia?	1977 Oct 26.3	65.09	88.24	6566	129	247	0.009	22

* International Sun-Earth Explorer, launched for ESA by NASA: ISEE 1 and 2 are sometimes called 'Mother' and 'Daughter' respectively.

** Cosmos 961 probably passed close to Cosmos 959 about 1977 Oct 26.3 (both orbits unconfirmed); then de-orbited into Pacific Ocean?

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Molniya 3H	1977-105A	1977 Oct 28.07 100 years?	Windmill + 6 vanes 1500?	4.2 long? 1.6 dia	1977 Nov 5.2	62.80	734.89	26977	428	40769	0.748	280
D	Molniya 3H launcher rocket	1977-105B	1977 Oct 28.07 21.59 days 1977 Nov 18.66	Cylinder 2500?	7.5 long 2.6 dia	1977 Oct 29.9	62.82	90.97	6701	206	440	0.017	133
D	Molniya 3H launcher	1977-105C	1977 Oct 28.07 29 days 1977 Nov 26	Irregular	-	1977 Oct 29.5	62.80	91.14	6709	208	454	0.018	120
	Molniya 3H rocket	1977-105E	1977 Oct 28.07 100 years?	Cylinder 440	2.0 long 2.0 dia	1977 Nov 21.0	62.86	731.66	26897	430	40608	0.747	280
D	Fragment	1977-105D											
T	Transat [Scout]	1977-106A	1977 Oct 28.20 2000 years	Octagonal cylinder 94	-	1977 Oct 30.1	89.92	107.03	7466	1069	1107	0.003	19
	Altair rocket	1977-106B	1977 Oct 28.20 2000 years	Cylinder 24	1.50 long 0.46 dia	1977 Oct 31.1	89.91	106.98	7463	1065	1104	0.003	20
T	Cosmos 962	1977-107A	1977 Oct 28.66 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1977 Oct 28.9	82.96	104.93	7368	968	1012	0.003	289
	Cosmos 962 rocket	1977-107B	1977 Oct 28.66 600 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Oct 29.4	82.93	104.81	7362	968	1000	0.002	282

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
I	Meteosat 1*	1977-108A	1977 Nov 23.07 >million years	Cylinder 697 full 295 empty	3.20 long 2.10 dia	1977 Nov 23.1 1977 Nov 25.4	27.48 0.73	654.78 1411.5	24978 41681	198 34913	37002 35692	0.737 0.009	180 60
	Meteosat 1 second stage	1977-108B	1977 Nov 23.07 200 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1977 Nov 23.1 1977 Nov 23.2	28.70 28.31	92.55 117.08	6778 7928	172 487	627 2612	0.034 0.134	160 48
	Meteosat 1 third stage	1977-108C	1977 Nov 23.07 5 years?	Sphere-cone 66	1.32 long 0.94 dia	1977 Nov 23.1	27.51	656.29	25016	185	37091	0.738	180
I	Cosmos 963	1977-109A	1977 Nov 24.60 3000 years	Spheroid + 2 paddles? 650?	1.6 dia?	1977 Nov 25.6	82.93	109.35	7574	1182	1210	0.002	238
	Cosmos 963 rocket	1977-109B	1977 Nov 24.60 2000 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Nov 25.7	82.93	109.23	7568	1179	1201	0.001	216
D	Cosmos 964	1977-110A	1977 Dec 4.50 12.76 days 1977 Dec 17.26	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1977 Dec 5.1 1977 Dec 9.2	72.88 72.88	89.85 89.24	6645 6614	171 169	362 303	0.014 0.010	81 74
R													
D	Cosmos 964 rocket	1977-110B	1977 Dec 4.50 5 days 1977 Dec 9	Cylinder 2500?	7.5 long 2.4 dia	1977 Dec 5.1	72.88	89.66	6635	168	346	0.013	78
D	Cosmos 964 engine**	1977-110D	1977 Dec 4.50 16 days 1977 Dec 20	Cone 600? full	1.5 long? 2 dia?	1977 Dec 16.7	72.87	89.59	6632	164	343	0.013	54
D	Fragments	1977-110C,E											

* Meteorological Satellite launched for ESA by NASA.

** Ejected from Cosmos 964 about 1977 Dec 16.

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 965	1977-111A	1977 Dec 8.46 738 days 1979 Dec 16	Octagonal ellipsoid? 550?	1.8 long? 1.5 dia?	1977 Dec 11.3	74.03	94.44	6869	465	516	0.004	326
D	Cosmos 965 rocket	1977-111B	1977 Dec 8.46 706 days 1979 Nov 14	Cylinder 2200?	7.4 long 2.4 dia	1977 Dec 9.0	74.03	94.34	6864	457	514	0.004	336
D	Fragments	1977-111C-AC											
T	NOSS 2 [Atlas]	1977-112A	1977 Dec 8.74 1600 years	Cylinder	-	1977 Dec 19.0	63.43	107.50	7490	1054	1169	0.008	157
	NOSS 2 rocket	1977-112B	1977 Dec 8.74 1000 years	-	-	1977 Dec 9.0	63.39	107.41	7485	1101	1113	0.001	118
T?	SSU 4	1977-112D	1977 Dec 8.74 1600 years	Box + aerials	0.3 x 0.9 x 2.4?	1977 Dec 29.5	63.44	107.50	7490	1054	1169	0.008	157
T?	SSU 5	1977-112E	1977 Dec 8.74 1600 years	Box + aerials	0.3 x 0.9 x 2.4?	1977 Dec 29.7	63.44	107.50	7490	1055	1168	0.008	156
T?	SSU 6	1977-112F	1977 Dec 8.74 1600 years	Box + aerials	0.3 x 0.9 x 2.4?	1977 Dec 29.7	63.44	107.50	7490	1055	1168	0.008	156
	Fragments	1977-112C,G											
D	Soyuz 26*	1977-113A	1977 Dec 10.05 37.43 days 1978 Jan 16.48	Sphere-cylinder 6570?	7.5 long 2.3 dia	1977 Dec 10.1 1977 Dec 10.7 1977 Dec 12.6	51.64 51.62 51.59	88.74 90.20 91.39	6593 6664 6724	195 251 337	235 321 354	0.003 0.005 0.001	64 256 347
2M R													
D	Soyuz 26 rocket	1977-113B	1977 Dec 10.05 2 days 1977 Dec 12	Cylinder 2500?	7.5 long 2.6 dia	1977 Dec 10.2	51.64	88.53	6583	187	222	0.003	71

* Soyuz 26 docked with Salyut 6 (second airlock) on 1977 Dec 11.13. Undocked from Salyut 6 on 1978 Jan 16 but landed with the Soyuz 27 cosmonauts (see page 516). The Soyuz 26 cosmonauts returned to Earth in Soyuz 27 craft on 1978 Mar 16.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	[Atlas Agena D]	1977-114A	1977 Dec 11.54? >million years	Cylinder 700 full? 350 empty?	1.7 long? 1.4 dia?	1977 Dec 11 1977 Dec 12.0 1978 Jan 1.0	29.9 28.2 0.2	87.68 733.2 1435.1	6545 26975 42145	146 191 35679	188 41002 35855	0.003 0.756 0.002	- -* -*
	Agena D rocket	1977-114B	1977 Dec 11.54? 5 years?	Cylinder 700	6 long? 1.5 dia	1977 Dec 12.0	28.2	733.2	26975	191	41002	0.756	-*
D R	Cosmos 966	1977-115A	1977 Dec 12.41 11.87 days 1977 Dec 24.28	Sphere-cylinder 5900?	5.9 long 2.4 dia	1977 Dec 12.5	65.03	89.50	6628	204	296	0.007	60
D	Cosmos 966 rocket	1977-115B	1977 Dec 12.41 6 days 1977 Dec 18	Cylinder 2500?	7.5 long 2.6 dia	1977 Dec 12.6	65.04	89.36	6621	202	284	0.006	52
D	Capsule	1977-115D	1977 Dec 12.41 26 days 1978 Jan 7	Ellipsoid 200 ?	0.9 long 1.9 dia	Orbit similar to 1977-115A							
D	Fragment	1977-115C											
T?	Cosmos 967	1977-116A	1977 Dec 13.66 1200 years	Cylinder?	4 long? 2 dia?	1977 Dec 19.0	65.84	104.77	7362	963	1005	0.003	301
	Cosmos 967 rocket	1977-116B	1977 Dec 13.66 600 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Dec 14.2	65.85	104.80	7364	963	1008	0.003	308
	Fragments	1977-116C,D											
T	Meteor 2-03	1977-117A	1977 Dec 14.40 500 years	Cylinder + 2 vanes 2750?	5 long? 1.5 dia?	1977 Dec 15.7	81.22	102.48	7253	856	894	0.003	273
	Meteor 2-03 rocket	1977-117B	1977 Dec 14.40 400 years	Cylinder 1440	3.8 long 2.6 dia	1977 Dec 15.6	81.22	102.50	7254	842	910	0.005	209

*Unconfirmed orbits.

Year of launch 1977 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Sakura* (CS 1)	1977-118A	1977 Dec 15.03 >million years	Cylinder 676 full 340 empty	3.51 long 2.18 dia	1977 Dec 16.0 1977 Dec 16.1	28.70 0.06	629.28 1440.0	24321 42241	155 35568	35732 36157	0.731 0.007	180 72
	Sakura second stage	1977-118B	1977 Dec 15.03 200 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1977 Dec 15.0 1977 Dec 18.5	28.76 28.65	92.05 111.14	6753 7664	165 482	585 2089	0.031 0.105	174 79
	Sakura third stage	1977-118D	1977 Dec 15.03 3 years?	Sphere-cone 66	1.32 long 0.94 dia	1977 Dec 15.0	28.78	634.69	24464	166	36006	0.733	179
	Fragment	1977-118C											
T	Cosmos 968	1977-119A	1977 Dec 16.19 120 years	Cylinder + paddles? 750?	2 long? 1 dia?	1977 Dec 16.9	74.03	100.80	7174	782	810	0.002	351
	Cosmos 968 rocket	1977-119B	1977 Dec 16.19 100 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Dec 16.9	74.03	100.66	7167	774	804	0.002	14
	Fragments	1977-119C,D											
D R	Cosmos 969	1977-120A	1977 Dec 20.66 13.59 days 1978 Jan 3.25	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1977 Dec 21.5 1977 Dec 23.3	62.81 62.81	89.45 89.20	6627 6614	180 166	317 306	0.010 0.011	74 65
D	Cosmos 969 rocket	1977-120B	1977 Dec 20.66 6 days 1977 Dec 26	Cylinder 2500?	7.5 long 2.6 dia	1977 Dec 21.0	62.80	89.37	6623	177	312	0.010	70
D	Cosmos 969 engine	1977-120C	1977 Dec 20.66 16 days 1978 Jan 5	Cone 600? full	1.5 long? 2 dia?	1978 Jan 3.1	62.81	89.37	6623	160	329	0.013	65
D	Fragments	1977-120D-F											
	Cosmos 970**	1977-121A	1977 Dec 21.44 disintegrated	Cylinder?	4 long? 2 dia?	1977 Dec 21.5 1977 Dec 21.6	65.16 65.85	94.67 106.04	6681 7423	144 949	861 1141	0.052 0.013	55 116

* Japanese Communications Satellite launched by NASA.

** Passed close to Cosmos 967, then exploded; continued on page 515

Year of launch 1977 concluded

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 970 rocket	1977-121B	1977 Dec 21.44 4 days 1977 Dec 25	Cylinder 1500?	8 long? 2.5 dia?	1977 Dec 21.4	65.16	94.78	6886	141	875	0.053	55
	Fragments	1977-121C-AM											
T	Cosmos 971	1977-122A	1977 Dec 23.68 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1977 Dec 26.6	82.93	105.04	7373	980	1010	0.002	247
	Cosmos 971 rocket	1977-122B	1977 Dec 23.68 600 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Dec 27.4	82.93	104.93	7368	977	1002	0.002	222
T	Cosmos 972	1977-123A	1977 Dec 27.33 200 years	- 825?	-	1977 Dec 27.6	75.85	103.92	7322	716	1172	0.031	52
	Cosmos 972 rocket	1977-123B	1977 Dec 27.33 150 years	Cylinder 2200?	7.4 long 2.4 dia	1977 Dec 27.7	75.83	103.88	7320	716	1168	0.031	52
D	Fragment	1977-123C											
D R	Cosmos 973	1977-124A	1977 Dec 27.39 12.91 days 1978 Jan 9.30	Sphere-cylinder 5900?	5.9 long 2.4 dia	1977 Dec 28.2	71.45	89.81	6642	203	325	0.009	58
D	Cosmos 973 rocket	1977-124B	1977 Dec 27.39 9 days 1978 Jan 5	Cylinder 2500?	7.5 long 2.6 dia	1977 Dec 29.1	71.43	89.46	6625	209	284	0.006	45
D	Capsule	1977-124D	1977 Dec 27.39 29 days 1978 Jan 25	Ellipsoid 200?	0.9 long 1.9 dia	1978 Jan 8.8	71.43	89.64	6634	199	312	0.009	32
D	Fragments	1977-124C,E											

Year of launch 1978

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 974	1978-01A	1978 Jan 6.66	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1978 Jan 7.5	62.81	89.61	6634	178	334	0.012	78
R			12.60 days 1978 Jan 19.26			1978 Jan 14.2	62.81	89.49	6628	175	325	0.011	74
D	Cosmos 974 rocket	1978-01B	1978 Jan 6.66 5 days 1978 Jan 11	Cylinder 2500?	7.5 long 2.6 dia	1978 Jan 8.7	62.80	89.09	6609	168	293	0.009	70
D	Cosmos 974 engine	1978-01D	1978 Jan 6.66 20 days 1978 Jan 26	Cone 600? full	1.5 long? 2 dia?	Orbit similar to 1978-01A							
D	Fragments	1978-01C,E											
T	Intelsat 4A (F-3)	1978-02A	1978 Jan 7.01 > million years	Cylinder 1500 full 795 empty	2.82 long? 2.39 dia	1978 Jan 7.0	21.82	640.44	.24612	549	35918	0.719	179
						1978 Mar 15.5	0.37	1436.12	42165	35783	35790	0.0001	-
	Intelsat 4A (F-3) rocket	1978-02B	1978 Jan 7.01 6000 years	Cylinder 1815	8.6 long 3.0 dia	1978 Jan 20.3	21.60	648.98	24830	612	36292	0.719	188
D	Soyuz 27*	1978-03A	1978 Jan 10.52	Sphere-cylinder 6570?	7.5 long 2.3 dia	1978 Jan 10.6	51.71	88.71	6592	190	237	0.004	90
2M			64.95 days			1978 Jan 10.8	51.58	89.90	6651	241	304	0.005	227
R			1978 Mar 16.47			1978 Jan 11.6	51.60	91.28	6718	330	350	0.002	101
D	Soyuz 27 rocket	1978-03B	1978 Jan 10.52 3 days 1978 Jan 13	Cylinder 2500?	7.5 long 2.6 dia	1978 Jan 10.8	51.64	88.68	6590	193	231	0.003	79

* Soyuz 27 docked with Salyut 6 (first airlock) on 1978 Jan 11.59; undocked from Salyut 6 on 1978 Mar 16.33, but landed with the Soyuz 26 crew. The Soyuz 27 cosmonauts returned to Earth in the Soyuz 26 craft, which undocked from Salyut 6 (second airlock) on 1978 Jan 16. See page 512.

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Cosmos 975	1978-04A	1978 Jan 10.56 60 years	Cylinder + 2 vanes? 2500?	5 long? 1.5 dia?	1978 Jan 12.4	81.22	97.62	7022	634	653	0.001	57
	Cosmos 975 rocket	1978-04B	1978 Jan 10.56 60 years	Cylinder 1440	3.8 long 2.6 dia	1978 Jan 19.6	81.23	97.63	7022	594	694	0.007	146
T	Cosmos 976	1978-05A	1978 Jan 10.87 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jan 12.9	74.03	115.14	7839	1457	1465	0.0005	77
T	Cosmos 977	1978-05B	1978 Jan 10.87 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jan 14.9	74.03	114.54	7812	1403	1465	0.004	81
T	Cosmos 978	1978-05C	1978 Jan 10.87 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jan 18.6	74.03	114.74	7821	1421	1465	0.003	87
T	Cosmos 979	1978-05D	1978 Jan 10.87 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jan 14.5	74.03	114.95	7831	1440	1465	0.002	86
T	Cosmos 980	1978-05E	1978 Jan 10.87 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jan 13.9	74.03	115.36	7850	1465	1478	0.0008	287
T	Cosmos 981	1978-05F	1978 Jan 10.87 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jan 12.7	74.03	115.59	7860	1465	1498	0.002	264

1978-05 continued on page 518

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Cosmos 982	1978-05G	1978 Jan 10.87 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jan 13.9	74.03	115.81	7870	1465	1518	0.003	273
T	Cosmos 983	1978-05H	1978 Jan 10.87 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jan 18.6	74.03	116.05	7881	1465	1540	0.005	258
	Cosmos 976 rocket	1978-05J	1978 Jan 10.87 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Jan 14.0	74.03	117.74	7957	1465	1693	0.014	268
D R	Cosmos 984	1978-06A	1978 Jan 13.64 12.7 days 1978 Jan 26.3	Sphere- cylinder 5700?	5.0 long 2.4 dia	1978 Jan 14.6	62.81	89.45	6627	206	291	0.007	80
D	Cosmos 984 rocket	1978-06B	1978 Jan 13.64 9 days 1978 Jan 22	Cylinder 2500?	7.5 long 2.6 dia	1978 Jan 14.7	62.79	89.31	6620	207	276	0.005	74
T	Cosmos 985*	1978-07A	1978 Jan 17.14 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1978 Jan 17.6	82.94	104.79	7362	945	1022	0.005	298
	Cosmos 985 rocket	1978-07B	1978 Jan 17.14 600 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Jan 23.7	82.94	104.66	7356	943	1012	0.005	279

* Navigation satellite

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Progress 1*	1978-08A	1978 Jan 20.35 18.81 days 1978 Feb 8.16	Sphere-cylinder 7020	7.9 long 2.3 dia	1978 Jan 20.5 1978 Jan 21.7 1978 Jan 22.4	51.61 51.66 51.60	88.73 90.29 91.25	6593 6670 6717	173 250 329	256 334 348	0.005 0.006 0.002	86 199 -
D	Progress 1 rocket	1978-08B	1978 Jan 20.35 3 days 1978 Jan 23	Cylinder 2500?	7.5 long 2.6 dia	1978 Jan 20.7	51.65	88.66	6589	188	234	0.004	79
T	Molniya 3J	1978-09A	1978 Jan 24.29 12 years	Windmill + 6 vanes 1500?	4.2 long? 1.6 dia	1978 Jan 26.4 1978 Feb 1.0	62.81 62.78	736.26 718.01	27010 26563	646 652	40618 39718	0.740 0.735	288 288
D	Molniya 3J launcher rocket	1978-09B	1978 Jan 24.29 47 days 1978 Mar 12	Cylinder 2500?	7.5 long 2.6 dia	1978 Jan 24.4	62.78	92.95	6798	215	624	0.030	117
D	Molniya 3J launcher	1978-09C	1978 Jan 24.29 38 days 1978 Mar 3	Irregular	-	1978 Jan 24.5	62.81	93.18	6809	219	643	0.031	120
	Molniya 3J rocket	1978-09E	1978 Jan 24.29 12 years	Cylinder 440	2.0 long 2.0 dia	1979 Jun 30.0	63.2	732.6	26920	813	40272	0.733	-
D	Fragment	1978-09D											
D R	Cosmos 986**	1978-10A	1978 Jan 24.41 13.8 days 1978 Feb 7.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1978 Jan 25.1 1978 Jan 25.7	65.01 65.02	89.39 89.64	6623 6636	172 171	318 344	0.011 0.013	70 68
D	Cosmos 986 rocket	1978-10B	1978 Jan 24.41 4 days 1978 Jan 28	Cylinder 2500?	7.5 long 2.6 dia	1978 Jan 24.5	65.01	89.29	6618	172	308	0.010	67

* Unmanned fuel-and-supplies ferry, without Soyuz descent capability. Docked with Salyut 6 (second airlock) on 1978 Jan 22.42. Separated Feb 6.25. De-orbited over Pacific Ocean two days later. ** Cosmos 986 manoeuvred, but no jettisoned engine was apparently tracked or designated.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D r	China 8*	1978-11A	1978 Jan 26.21 12 days 1978 Feb 7	Cylinder? 3600, then 1200?	-	1978 Jan 26.7	57.03	90.90	6698	161	479	0.024	160
D	China 8 rocket	1978-11B	1978 Jan 26.21 11 days 1978 Feb 6	Cylinder	-	1978 Jan 26.7	57.02	90.79	6693	160	469	0.023	159
T	IUE 1**	1978-12A	1978 Jan 26.73 >million years	Octagonal- cylinder 669 full	4.3 long 1.3 dia	1978 Jan 26.8 1978 Jan 28.3	28.71 28.63	840.64 1435.7	29505 42157	173 25669	46081 45888	0.778 0.240	257 257
D	IUE 1 second stage	1978-12B	1978 Jan 26.73 26 days 1978 Feb 21	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1978 Jan 26.8	28.74	96.56	6972	164	1024	0.062	254
	IUE 1 third stage	1978-12C	1978 Jan 26.73 3½ years?†	Sphere- cone 66	1.32 long 0.94 dia	Orbit similar to 1978-12A transfer orbit							
D R	Cosmos 987	1978-13A	1978 Jan 31.62 13.6 days 1978 Feb 14.2	Sphere- cylinder 6300?	6.5 long? 2.4 dia	1978 Feb 1.5 1978 Feb 6.1	62.80 62.80	89.44 89.72	6626 6640	175 173	321 351	0.011 0.013	71 71
D	Cosmos 987 rocket	1978-13B	1978 Jan 31.62 4 days 1978 Feb 4	Cylinder 2500?	7.5 long 2.6 dia	1978 Feb 2.2	62.80	89.18	6613	169	301	0.010	67

*Capsule returned to Earth about 1978 Jan 30. **IUE is International Ultraviolet Explorer, launched by NASA.
†Decay possible in 1981; if not, lifetime 7 years.

1978-13 continued on page 521

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 987 engine*	1978-13E	1978 Jan 31.62 20 days 1978 Feb 20	Cone 600? full	1.5 long? 2.0 dia?	Orbit similar to 1978-13A							
D	Fragments	1978-13C,D											
T	Kyokko** (EXOS A)	1978-14A	1978 Feb 4.29 300 years	Cylinder 103	0.8 long 0.95 dia	1978 Feb 7.8	65.37	134.27	8687	642	3975	0.192	334
D	Kyokko rocket [MU-3H]	1978-14B	1978 Feb 4.29 373 days 1979 Feb 12	Cylinder?	-	1978 Feb 5.9	65.09	94.26	6862	331	636	0.022	160
D R	Cosmos 988	1978-15A	1978 Feb 8.51 11.80 days 1978 Feb 20.31	Sphere-cylinder 5900?	5.9 long 2.4 dia	1978 Feb 11.8	72.84	89.87	6646	201	335	0.010	66
D	Cosmos 988 rocket	1978-15B	1978 Feb 8.51 9 days 1978 Feb 17	Cylinder 2500?	7.5 long 2.6 dia	1978 Feb 12.8	72.84	89.35	6620	195	289	0.007	52
D	Capsule	1978-15F	1978 Feb 8.51 31 days 1978 Mar 11	Ellipsoid 200?	0.9 long 1.9 dia	Orbit similar to 1978-15A							
D	Fragments	1978-15C-E,G											
T	Fleetsatcom 1	1978-16A	1978 Feb 9.89 > million years	Hexagonal cylinder 1884 full	1.27 long 2.44 dia	1978 Feb 9.9 1979 Jun 30.0	26.46 1.7	634.16 1436.0	24451 42163	167 35755	35978 35816	0.732 0.001	182 -
	Fleetsatcom 1 rocket	1978-16B	1978 Feb 9.89 6 years	Cylinder 1815	8.6 long 3.0 dia	1978 Feb 9.9	26.40	620.40	24096	172	35263	0.728	182

*Jettisoned from Cosmos 987 about 1978 Feb 13. **Japanese contribution to International Magnetospheric Study; Kyokko means aurora.

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 989	1978-17A	1978 Feb 14.40 13.8 days 1978 Feb 28.2	Sphere-cylinder 5900?	5.9 long? 2.4 dia	1978 Feb 20.1	65.05	89.36	6622	169	318	0.011	67
D	Cosmos 989 rocket	1978-17B	1978 Feb 14.40 3 days 1978 Feb 17	Cylinder 2500?	7.5 long 2.6 dia	1978 Feb 15.4	65.06	89.28	6618	165	314	0.011	72
D	Capsule?†	1978-17C	1978 Feb 14.40 15 days 1978 Mar 1	Ellipsoid 200?	0.9 long 1.9 dia	Orbit similar to 1978-17A							
D	Fragment	1978-17D											
T	Ume 2* (ISS 2)	1978-18A	1978 Feb 16.17 1400 years	Cylinder 140	0.82 long 0.94 dia	1978 Feb 18.7	69.37	107.25	7478	975	1224	0.017	202
	Ume 2 rocket [Nu]	1978-18B	1978 Feb 16.17 700 years	Cylinder?	-	1978 Feb 18.7	69.36	107.24	7477	975	1223	0.017	202
T	Cosmos 990	1978-19A	1978 Feb 17.69 120 years	Cylinder + paddles? 750?	2 long? 1 dia?	1978 Feb 18.2	74.05	100.80	7174	783	809	0.002	359
	Cosmos 990 rocket	1978-19B	1978 Feb 17.69 100 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Feb 19.9	74.04	100.67	7168	774	805	0.002	21

*Japanese Ionospheric Sounding Satellite. † Possibly an engine.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Navstar 1 (GPS)*	1978-20A	1978 Feb 22.99 1 million years	Cylinder + 4 vanes 433	-	1978 Mar 7.0	63.27	718.67	26580	20095	20308	0.004	348
	Navstar 1 rocket [Atlas F]	1978-20B	1978 Feb 22.99 40 years	Cone-cylinder? 163?	1.85 long? 0.63 to 1.65 dia?	1978 Feb 23.2	63.00	354.81	16605	161	20292	0.606	158
T	Satellite Data System 4 [Titan 3B Agena D]	1978-21A	1978 Feb 25.2? 10 years?	Cylinder	-	1978 Feb 25	63.15	703.7	26222	311	39377	0.745	270**
	Agena D rocket	1978-21B	1978 Feb 25.2? 10 years?	Cylinder 700?	6 long? 1.5 dia	Orbit similar to 1978-21A							
T	Cosmos 991	1978-22A	1978 Feb 28.28 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1978 Mar 1.1	82.98	104.84	7364	963	1009	0.003	301
	Cosmos 991 rocket	1978-22B	1978 Feb 28.28 600 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Mar 2.2	82.98	104.74	7359	960	1002	0.003	287
D	Soyuz 28†	1978-23A	1978 Mar 2.64 7.93 days 1978 Mar 10.57	Sphere-cylinder 6570?	7.5 long 2.3 dia	1978 Mar 2.9	51.63	88.82	6597	192	246	0.004	86
2M						1978 Mar 3.3	51.62	90.02	6657	251	306	0.004	283
R						1978 Mar 3.9	51.62	91.35	6722	334	353	0.001	233
D	Soyuz 28 rocket	1978-23B	1978 Mar 2.64 3 days 1978 Mar 5	Cylinder 2500?	7.5 long 2.6 dia	1978 Mar 3.2	51.63	88.80	6596	191	245	0.004	87

* Global Positioning System

** Approximate orbit

† Soyuz 28 docked with Salyut 6 (2nd airlock) on 1978 Mar 3 at 17:10 UT, with one Russian and one Czechoslovak cosmonaut; undocked 1978 Mar 10.43

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Molniya 1AQ	1978-24A	1978 Mar 2.92 14¼ years	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1978 Mar 5.0 1978 Mar 13.1	62.82 62.83	738.14 717.79	27056 26557	617 615	40739 39743	0.741 0.737	288 288
D	Molniya 1AQ launcher	1978-24B	1978 Mar 2.92 39 days 1978 Apr 10	Irregular	-	1978 Mar 4.5	62.83	92.70	6786	210	605	0.029	116
D	Molniya 1AQ launcher rocket	1978-24C	1978 Mar 2.92 38 days 1978 Apr 9	Cylinder 2500?	7.5 long 2.6 dia	1978 Mar 4.2	62.76	92.48	6775	219	575	0.026	118
	Molniya 1AQ rocket	1978-24D	1978 Mar 2.92 14¼ years	Cylinder 440	2.0 long 2.0 dia	1979 Jun 30.0	63.9	729.4	26843	671	40259	0.737	-
D R	Cosmos 992	1978-25A	1978 Mar 4.32 12.9 days 1978 Mar 17.2	Sphere-cylinder 5700?	5.0 long 2.4 dia	1978 Mar 4.8	71.34	89.79	6641	203	323	0.009	59
D	Cosmos 992 rocket	1978-25B	1978 Mar 4.32 6 days 1978 Mar 10	Cylinder 2500?	7.5 long 2.6 dia	1978 Mar 4.8	71.34	89.63	6633	201	309	0.008	50
D	Fragment	1978-25C											
T	Landsat 3 (ERTS 3)	1978-26A	1978 Mar 5.75 100 years	Cone + 2 paddles 960	3.0 long 1.45 dia 3.96 span	1978 Mar 5.8	99.14	103.21	7287	900	918	0.001	307
T	Oscar 8	1978-26B	1978 Mar 5.75 100 years	Rectangular box 27	0.43 x 0.30 x 0.15?	1978 Mar 5.9	98.99	103.23	7288	903	917	0.001	221
	Landsat 3 second stage*	1978-26C	1978 Mar 5.75 100 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1978 Mar 5.9	98.95	103.22	7288	906	913	0.001	306

* Carried PIX - a 34 kg Plasma Interaction Experiment.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 993	1978-27A	1978 Mar 10.45	Sphere-cylinder	6.5 long?	1978 Mar 11.8	72.86	89.63	6634	171	340	0.013	79
R			12.7 days	6300?	2.4 dia	1978 Mar 18.1	72.85	90.15	6660	170	393	0.017	64
			1978 Mar 23.2										
D	Cosmos 993 rocket	1978-27B	1978 Mar 10.45	Cylinder	7.5 long	1978 Mar 11.3	72.86	89.32	6618	170	310	0.011	76
			4 days	2500?	2.6 dia								
			1978 Mar 14										
D	Cosmos 993 engine	1978-27D	1978 Mar 10.45	Cone	1.5 long?	Orbit similar to 1978-27A							
			14 days	600? full	2 dia?								
			1978 Mar 24										
D	Fragment	1978-27C											
T	Cosmos 994	1978-28A	1978 Mar 15.66	Cylinder	1.3 long?	1978 Mar 18.4	82.93	105.05	7374	980	1011	0.002	261
			1200 years	700?	1.9 dia?								
	Cosmos 994 rocket	1978-28B	1978 Mar 15.66	Cylinder	7.4 long	1978 Mar 18.4	82.93	104.93	7368	977	1003	0.002	245
			600 years	2200?	2.4 dia								
D	[Titan 3D]	1978-29A	1978 Mar 16.78	Cylinder	15 long	1978 Mar 23.2	96.43	88.52	6578	160	240	0.006	125
			179 days	13300? full	3.0 dia								
			1978 Sep 11										
T	Capsule	1978-29B	1978 Mar 16.78	Octagon?	0.3 long?	1978 Mar 19.8	95.83	97.59	7020	639	645	0.0004	290
			60 years	60?	0.9 dia								
D	Titan 3D rocket	1978-29C	1978 Mar 16.78	Cylinder	6 long	Orbit similar to 1978-29A							
			1 day	1900	3.0 dia								
			1978 Mar 17										

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 995	1978-30A	1978 Mar 17.45 12.85 days 1978 Mar 30.30	Sphere-cylinder 5700?	5.0 long 2.4 dia	1978 Mar 18.5	81.34	89.05	6604	217	235	0.001	52
D	Cosmos 995 rocket	1978-30B	1978 Mar 17.45 3 days 1978 Mar 20	Cylinder 2500?	7.5 long 2.6 dia	1978 Mar 17.8	81.34	88.81	6592	208	220	0.001	58
T	Cosmos 996	1978-31A	1978 Mar 28.06 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1978 Mar 28.3	82.93	104.80	7362	957	1010	0.004	299
	Cosmos 996 rocket	1978-31B	1978 Mar 28.06 600 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Mar 31.5	82.92	104.70	7357	957	1000	0.003	288
D R?	Cosmos 997	1978-32A	1978 Mar 30.00 < 1 day 1978 Mar 30	-	-	Orbit similar to 1978-32C							
D R?	Cosmos 998	1978-32B	1978 Mar 30.00 < 1 day 1978 Mar 30	-	-	Orbit similar to 1978-32C							
D	Cosmos 997 rocket	1978-32C	1978 Mar 30.00 3 days 1978 Apr 2	Cylinder 4000?	12 long? 4 dia	1978 Mar 30.1	51.60	88.45	6579	188	213	0.002	237
D	Fragment	1978-32D											

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 999	1978-33A	1978 Mar 30.33 12.89 days 1978 Apr 12.22	Sphere-cylinder 5900?	5.9 long? 2.4 dia	1978 Mar 31.3	71.39	89.79	6641	174	352	0.013	55
D	Cosmos 999 rocket	1978-33B	1978 Mar 30.33 4 days 1978 Apr 3	Cylinder 2500?	7.5 long 2.6 dia	1978 Mar 31.4	71.40	89.43	6623	174	316	0.011	50
D	Capsule?†	1978-33E	1978 Mar 30.33 25 days 1978 Apr 24	Ellipsoid? 200?	0.9 long? 1.9 dia?	Orbit similar to 1978-33A							
D	Fragments	1978-33C,D											
T	Cosmos 1000*	1978-34A	1978 Mar 31.58 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1978 Mar 31.9	82.93	104.90	7367	965	1012	0.003	290
	Cosmos 1000 rocket	1978-34B	1978 Mar 31.58 600 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Mar 31.9	82.94	104.78	7361	964	1001	0.003	294
T	Intelsat 4A(F-6)††	1978-35A	1978 Mar 31.98 > million years	Cylinder 1500 full 795 empty	2.82 long? 2.39 dia	1978 Apr 1.0 1978 Jul 15.0	21.85 0.3	641.03 1436.1	24627 42165	549 35768	35949 35806	0.719 0.0005	179 -
	Intelsat 4A(F-6) rocket	1978-35B	1978 Mar 31.98 6000 years	Cylinder 1815	8.6 long 3.0 dia	1978 Apr 25.9	21.90	647.40	24790	596	36227	0.719	195

* Navigational beacon. †Possibly an engine. †† Intelsat 4A(F-5) failed to reach orbit on 1977 Sep 29.

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 1001	1978-36A	1978 Apr 4.63	-	-	1978 Apr 4.8	51.62	88.71	6592	199	228	0.002	84
R?			10.87 days			1978 Apr 6.2	51.63	89.28	6620	196	288	0.007	66
			1978 Apr 15.50			1978 Apr 11.6	51.61	90.73	6691	307	318	0.001	302
D	Cosmos 1001 rocket	1978-36B	1978 Apr 4.63	-	-	1978 Apr 4.8	51.63	88.59	6586	198	217	0.001	90
			2 days										
			1978 Apr 6										
D	Fragments	1978-36C-F											
D	Cosmos 1002	1978-37A	1978 Apr 6.39	Sphere-cylinder 5700?	5.0 long 2.4 dia	1978 Apr 8.8	65.05	89.37	6622	205	283	0.006	52
R			12.84 days										
			1978 Apr 19.23										
D	Cosmos 1002 rocket	1978-37B	1978 Apr 6.39	Cylinder 2500?	7.5 long 2.6 dia	1978 Apr 7.3	65.05	89.13	6610	197	267	0.005	28
			4 days										
			1978 Apr 10										
D	Fragments	1978-37C,D											
T	[Atlas Agena D]*	1978-38A	1978 Apr 8.03	Cylinder 700 full? 350 empty?	1.7 long? 1.4 dia?	1978 Apr 8.0	29.9	87.72	6547	149	189	0.003	-
			> million years			1978 Apr 8.4	28.4	615.5	23970	150	35033	0.728	-
						Probably entered synchronous orbit similar to 1977-114A							
	Agena D rocket	1978-38B	1978 Apr 8.03	Cylinder 700	6 long? 1.5 dia	Orbit similar to 1978-38A second orbit							
			5 years?										
T	Yuri (BSE 1)**	1978-39A	1978 Apr 7.92	Irregular 678 full 327 empty	3.09 long 1.32 wide 1.2 deep	1978 Apr 8.7	27.23	627.64	24287	164	35653	0.731	180
			> million years			1978 Apr 9.5	0.10	1415.75	41766	35115	35662	0.007	266
						1978 Apr 26.5	0.08	1436.0	42163	35784	35786	0	247
	Yuri second stage	1978-39B	1978 Apr 7.92	Cylinder+ annulus 350?	6.4 long 1.52 and 2.44 dia	1978 Apr 7.9	28.64	92.93	6796	165	671	0.037	173
			250 years			1978 Apr 20.2	28.23	111.35	7673	569	2021	0.095	143

* Early warning satellite development, launched from Cape Canaveral at 19h 45m Eastern Standard Time April 7 (00h 45m UT April 8)

** Broadcasting Satellite Experiment launched for Japan by NASA; continued on page 529.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Yuri third stage	1978-39C	1978 Apr 7.92 2 years?	Sphere - cone 66	1.32 long 0.94 dia	Orbit similar to 1978-39A transfer orbit							
D	Cosmos 1003	1978-40A	1978 Apr 20.65 13.6 days 1978 May 4.3	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1978 Apr 20.9	62.81	89.54	6631	178	328	0.011	71
R						1978 Apr 23.9	62.81	88.89	6599	162	279	0.009	52
D	Cosmos 1003 rocket	1978-40B	1978 Apr 20.65 3 days 1978 Apr 23	Cylinder 2500?	7.5 long 2.6 dia	1978 Apr 21.2	62.80	89.32	6620	169	315	0.011	68
D	Cosmos 1003 engine	1978-40D	1978 Apr 20.65 14 days 1978 May 4	Cone 600? full	1.5 long? 2 dia?	Orbit similar to 1978-40A							
D	Fragments	1978-40C,E											
T	HCMM (AEM 1)*	1978-41A	1978 Apr 26.43 60 years	Hexagonal prism 134	0.64 long 0.7 wide	1978 May 1.4	97.60	96.72	6979	560	641	0.006	245
	HCMM rocket [Scout]	1978-41B	1978 Apr 26.43 40 years	Cylinder 24	1.50 long 0.46 dia	1978 Apr 30.1	97.60	96.89	6987	564	653	0.006	250
T	AMS 3 [Thor Burner 2]	1978-42A	1978 May 1.13 80 years	Irregular 513	6.40 long 1.68 dia	1978 May 1.9	98.71	101.47	7206	820	835	0.001	212
	Burner 2 rocket	1978-42B	1978 May 1.13 60 years	Sphere - cone 66	1.32 long 0.94 dia	Orbit similar to 1978-42A							
	Fragments	1978-42C-E											

* Heat Capacity Mapping Mission (Applications Explorer Mission)

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 1004	1978-43A	1978 May 5.65 12.6 days 1978 May 18.3	Sphere - cylinder 5700?	5.0 long 2.4 dia	1978 May 6.3	62.81	89.43	6626	205	290	0.006	78
D	Cosmos 1004 rocket	1978-43B	1978 May 5.65 4.24 days 1978 May 9.89	Cylinder 2500?	7.5 long 2.6 dia	1978 May 5.9	62.80	89.27	6618	200	279	0.006	65
D	Fragments	1978-43C-G											
T	OTS 2 *	1978-44A	1978 May 11.96 > million years	Hexagonal box 865 full 444 empty	2.13 long 1.68 wide 2.39 high	1978 May 12.0	27.32	633.80	24442	184	35943	0.732	179
							Entered synchronous orbit on 1978 May 13						
	OTS 2 second stage	1978-44B	1978 May 11.96 60000 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1978 May 11.9 1978 May 15.3	28.45 27.93	107.09 139.69	7470 8924	180 1568	2004 3524	0.122 0.110	173 86
	OTS 2 third stage	1978-44C	1978 May 11.96 20 years	Sphere - cone 66	1.32 long 0.94 dia	1978 May 12.0	27.32	633.17	24436	182	35933	0.732	179
T ?	Cosmos 1005	1978-45A	1978 May 12.17 60 years	Cylinder + 2 vanes? 2500?	5 long? 1.5 dia?	1978 May 16.6	81.24	97.54	7018	627	653	0.002	0
	Cosmos 1005 rocket	1978-45B	1978 May 12.17 60 years	Cylinder 1440	3.8 long 2.6 dia	1978 May 15.2	81.25	97.69	7025	603	691	0.006	167

* Orbital Test Satellite launched for ESA by NASA (OTS 1 failed to enter orbit on 1977 Sep 13).

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 1006	1978-46A	1978 May 12.46 306 days 1979 Mar 14	Cylinder?	4 long? 2 dia?	1978 May 14.8	65.85	92.45	6773	382	408	0.002	342
D	Cosmos 1006 rocket	1978-46B	1978 May 12.46 208 days 1978 Dec 6	Cylinder 2200?	7.4 long 2.4 dia	1978 May 13.9	65.85	92.33	6767	373	405	0.002	7
T	Navstar 2 (GPS)	1978-47A	1978 May 13.44 1 million years	Cylinder + 4 vanes 433	-	1978 May 22.0	63.13	711.30	26396	19952	20084	0.003	98
	Navstar 2 rocket [Atlas F]	1978-47B	1978 May 13.44 30 years	Cone - cylinder? 163?	1.85 long? 0.63 to 1.65 dia?	1978 May 16.1	63.07	350.45	16466	162	20014	0.603	158
D	Cosmos 1007	1978-48A	1978 May 16.45 12.7 days 1978 May 29.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1978 May 16.7 1978 May 16.9	72.83 72.84	89.69 89.80	6637 6643	168 170	350 359	0.014 0.014	82 83
R													
D	Cosmos 1007 rocket	1978-48B	1978 May 16.45 4 days 1978 May 20	Cylinder 2500?	7.5 long 2.6 dia	1978 May 17.1	72.83	89.57	6631	170	336	0.013	80
D	Cosmos 1007 engine	1978-48D	1978 May 16.45 15 days 1978 May 31	Cone 600? full	1.5 long? 2 dia?	1978 May 28.7	72.80	89.27	6616	158	317	0.012	53
D	Fragments	1978-48C,E											

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Cosmos 1008	1978-49A	1978 May 17.61 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1978 May 21.5	74.04	95.12	6902	499	549	0.004	332
	Cosmos 1008 rocket	1978-49B	1978 May 17.61 10 years	Cylinder 2200?	7.4 long 2.4 dia	1978 May 21.3	74.05	95.00	6896	488	548	0.004	334
3d	Fragments	1978-49C-F											
D	Cosmos 1009 *	1978-50A	1978 May 19.02 0.17 day? 1978 May 19.19?	Cylinder?	4 long? 2 dia?	Initial transfer orbit similar to 1978-50B 1978 May 19.1	65.86	108.64	7543	966	1364	0.026	41
D	Cosmos 1009 rocket	1978-50B	1978 May 19.02 17 days 1978 Jun 5	Cylinder 1500?	8 long? 2.5 dia?	1978 May 19.9	65.14	97.41	7014	147	1125	0.070	57
D	Fragments	1978-50C,D											
D R	Cosmos 1010	1978-52A	1978 May 23.32 12.83 days 1978 Jun 5.15	Sphere - cylinder 5900?	5.9 long 2.4 dia	1978 May 24.2	81.37	88.99	6602	217	230	0.001	55
D	Cosmos 1010 rocket	1978-52B	1978 May 23.32 3 days 1978 May 26	Cylinder 2500?	7.5 long 2.6 dia	1978 May 23.4	81.37	88.91	6598	212	227	0.001	16
D	Capsule	1978-52C	1978 May 23.32 15 days 1978 Jun 7	Ellipsoid 200?	0.9 long 1.9 dia	Orbit similar to 1978-52A							

Space Vehicle : Pioneer Venus 1 (1978-51A), and Centaur rocket (1978-51B)

* May have passed close to Cosmos 967 (1977-116A). Probably re-entered near 10°N, 147°E?

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Cosmos 1011	1978-53A	1978 May 23.70 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1978 May 24.9	82.91	104.90	7367	961	1016	0.004	286
	Cosmos 1011 rocket	1978-53B	1978 May 23.70 600 years	Cylinder 2200?	7.4 long 2.4 dia	1978 May 24.2	82.92	104.78	7361	961	1004	0.003	283
D R	Cosmos 1012	1978-54A	1978 May 25.61 12.6 days 1978 Jun 7.2	Sphere - cylinder 5700?	5.0 long 2.4 dia	1978 May 26.6	62.80	89.15	6612	202	265	0.005	51
D	Cosmos 1012 rocket	1978-54B	1978 May 25.61 3 days 1978 May 28	Cylinder 2500?	7.5 long 2.6 dia	1978 May 26.1	62.80	88.90	6599	189	253	0.005	25
T	Molniya 1AR	1978-55A	1978 Jun 2.51 100 years?	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1978 Jun 3.1 1978 Jun 9.7	62.85 62.81	736.26 718.15	27010 26567	422 423	40842 39954	0.748 0.744	280 280
D	Molniya 1AR launcher	1978-55B	1978 Jun 2.51 19 days 1978 Jun 21	Irregular	-	1978 Jun 3.0	62.85	90.85	6695	211	422	0.016	130
D	Molniya 1AR launcher rocket	1978-55C	1978 Jun 2.51 15 days 1978 Jun 17	Cylinder 2500?	7.5 long 2.6 dia	1978 Jun 3.1	62.84	90.83	6694	195	436	0.018	120
	Molniya 1AR rocket	1978-55E	1978 Jun 2.51 100 years?	Cylinder 440	2.0 long 2.0 dia	1979 Jun 30.0	63.2	732.5	26917	619	40460	0.740	-
D	Fragment	1978-55D											

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Cosmos 1013	1978-56A	1978 Jun 7.91 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jun 11.5	74.02	116.40	7897	1480	1557	0.005	239
T	Cosmos 1014	1978-56B	1978 Jun 7.91 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jun 11.9	74.02	116.15	7885	1480	1534	0.003	234
T	Cosmos 1015	1978-56C	1978 Jun 7.91 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jun 11.4	74.02	115.93	7875	1475	1519	0.003	212
T	Cosmos 1016	1978-56D	1978 Jun 7.91 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jun 11.4	74.02	115.70	7865	1473	1501	0.002	186
T	Cosmos 1017	1978-56E	1978 Jun 7.91 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jun 11.5	74.02	115.49	7856	1460	1495	0.002	153
T	Cosmos 1018	1978-56F	1978 Jun 7.91 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jun 10.9	74.02	115.27	7846	1444	1491	0.003	131
T	Cosmos 1019	1978-56G	1978 Jun 7.91 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jun 11.5	74.02	115.06	7836	1425	1491	0.004	122
T	Cosmos 1020	1978-56H	1978 Jun 7.91 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Jun 10.9	74.02	114.85	7827	1410	1487	0.005	108
	Cosmos 1013 rocket	1978-56J	1978 Jun 7.91 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Jun 10.5	74.02	117.95	7967	1486	1691	0.013	262

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 1021	1978-57A	1978 Jun 10.36	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1978 Jun 11.8	65.03	89.35	6621	173	313	0.011	59
R			12.85 days			1978 Jun 18.4	65.03	89.46	6627	171	326	0.012	56
			1978 Jun 23.21										
D	Cosmos 1021 rocket	1978-57B	1978 Jun 10.36	Cylinder 2500?	7.5 long 2.6 dia	1978 Jun 10.5	65.04	89.29	6618	172	308	0.010	58
			3 days										
			1978 Jun 13										
D	Cosmos 1021 engine	1978-57D	1978 Jun 10.36	Cone 600? full	1.5 long? 2 dia?	1978 Jun 24.3	65.02	88.72	6590	167	256	0.007	52
			16 days										
			1978 Jun 26										
D	Fragment	1978-57C											
T	[Titan 3C]*	1978-58A	1978 Jun 10.80	-	-	1978 Jun 11.0	26.3	633.0	24445	295	35840	0.727	180
			>million years			1978 Jul 1.0	12.0	1446.3	42362	29929	42039	0.143	-
	Transtage	1978-58B	1978 Jun 10.80	Cylinder 1500?	6 long? 3.0 dia								
			>million years					Orbits similar to 1978-58A					
D	Titan 3C second stage	1978-58C	1978 Jun 10.80	Cylinder 1900	6 long 3.0 dia	1978 Jun 10.8	29.98	91.14	6716	152	524	0.028	125
			4 days										
			1978 Jun 14										

* Probable early-warning satellite.

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 1022	1978-59A	1978 Jun 12.44	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1978 Jun 14.4	72.84	89.67	6636	171	344	0.013	77
R			12.76 days			1978 Jun 22.6	72.84	89.69	6637	167	350	0.014	60
			1978 Jun 25.20										
D	Cosmos 1022 rocket	1978-59B	1978 Jun 12.44 4 days 1978 Jun 16	Cylinder 2500?	7.5 long 2.6 dia	1978 Jun 12.8	72.85	89.54	6629	167	335	0.013	80
D	Cosmos 1022 engine	1978-59C	1978 Jun 12.44 16 days 1978 Jun 28	Cone 600? full	1.5 long? 2 dia?	1978 Jun 24.7	72.86	89.48	6626	166	330	0.012	51
D	Fragment	1978-59D											
T	[Titan 3D]	1978-60A	1978 Jun 14.77 25 months*	Cylinder 13300? full	15 long 3.0 dia	1978 Jun 15.7	96.96	91.90	6744	223	509	0.021	159
						1978 Jun 16.5	96.82	92.42	6771	276	509	0.017	155
D	Titan 3D rocket	1978-60B	1978 Jun 14.77 40 days 1978 Jul 24	Cylinder 1900	6 long 3.0 dia	1978 Jun 15.3	96.96	91.74	6736	221	495	0.020	158
D	Fragments	1978-60C-F											
D	Soyuz 29**	1978-61A	1978 Jun 15.85	Sphere-cylinder 6570?	7.5 long 2.3 dia	1978 Jun 16.0	51.63	88.85	6599	193	248	0.004	74
2M			79.64 days			1978 Jun 16.2	51.64	90.07	6659	253	309	0.004	262
R			1978 Sep 3.49			1978 Jun 22.6	51.63	91.39	6724	338	353	0.001	32
D	Soyuz 29 rocket	1978-61B	1978 Jun 15.85 3 days 1978 Jun 18	Cylinder 2500?	7.5 long 2.6 dia	1978 Jun 16.4	51.62	88.63	6588	186	233	0.004	76

* Dependent on orbital manoeuvres.

** Soyuz 29 docked with Salyut 6 (first airlock) 1978 Jun 16.92; undocked from Salyut 6 on 1978 Sep 3, but landed with the Soyuz 31 crew (see page 543).

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	GOES 3	1978-62A	1978 Jun 16.46 >million years	Cylinder + boom 627 full 243 empty	2.30 long 1.90 dia	1978 Jun 16.5 1978 Jun 17.1 1979 Jun 30.0	23.90 1.78 0.3	649.03 1446.85 1436.1	24832 42375 42165	198 35473 35781	36709 36521 35794	0.735 0.012 0	178 164 -
	GOES 3 second stage	1978-62B	1978 Jun 16.46 200 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1978 Jun 16.5 1978 Jun 20.4	28.42 28.43	93.83 108.01	6840 7520	178 553	746 1730	0.042 0.078	165 97
	GOES 3 third stage	1978-62C	1978 Jun 16.46 10 years?	Sphere-cone 66	1.32 long 0.94 dia	1978 Jun 16.5	23.79	655.06	24988	167	37053	0.738	177
	GOES 3 apogee motor	1978-62D	1978 Jun 16.46 >million years	- 384 full	-	Orbit similar to second 1978-62A orbit							
T	Cosmos 1023	1978-63A	1978 Jun 21.40 120 years	Cylinder + paddles? 750?	2 long? 1 dia?	1978 Jun 24.7	74.08	100.76	7172	783	805	0.002	356
	Cosmos 1023 rocket	1978-63B	1978 Jun 21.40 100 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Jun 24.7	74.08	100.63	7166	773	803	0.002	18
L	SEASAT 1 [Atlas Agena D]	1978-64A	1978 Jun 27.05 200 years	Cylinder + 4 wings 2300	21 long 1.5 dia 11 span	1978 Jun 27.4	108.02	100.63	7166	776	800	0.002	263

AD-A084 193 ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND) F/G 22/2
TABLE OF EARTH SATELLITES. VOLUMES 3. 1974 TO 1978.(U)
JAN 80 J A PILKINGTON, D G KING-HELE
UNCLASSIFIED RAE-TR-80001 DRIC -BR-72771 NL

3 OF 3
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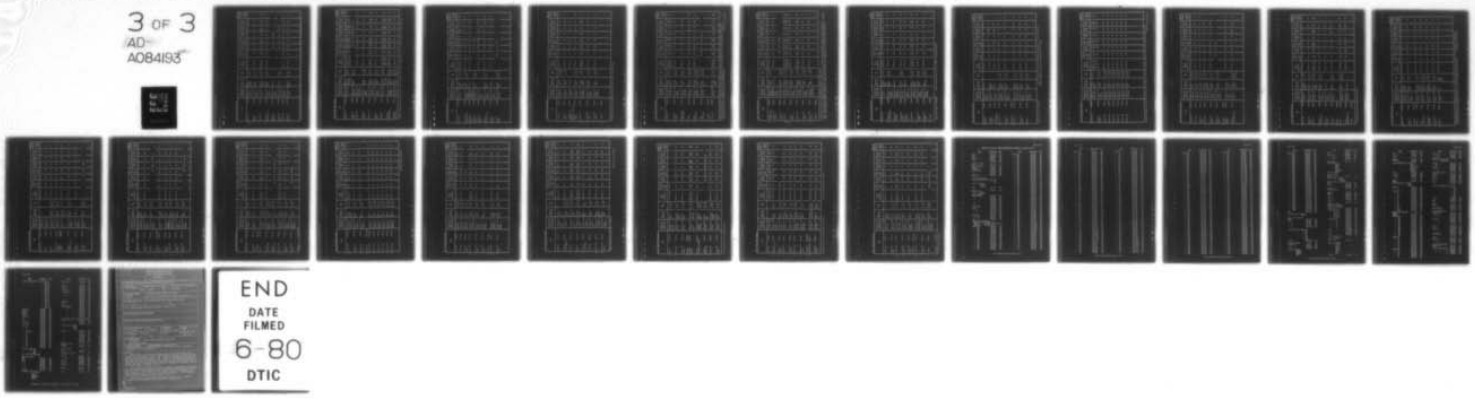

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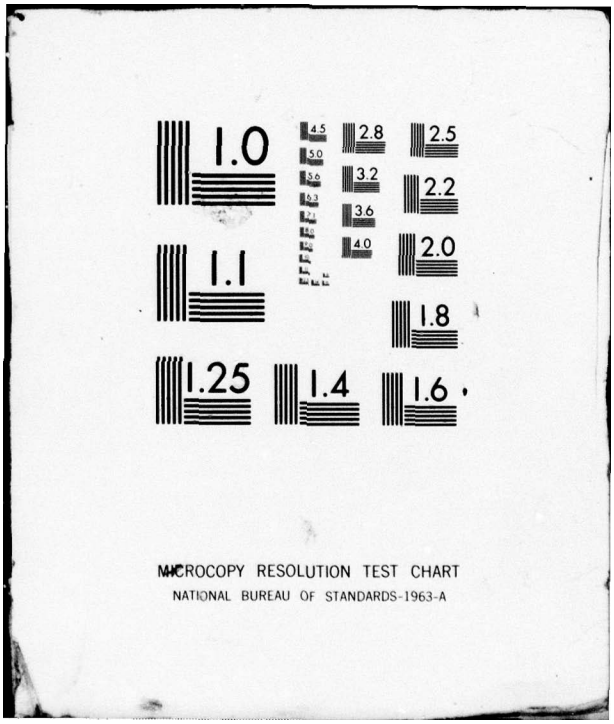
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D 2M R	Soyuz 30*	1978-65A	1978 Jun 27.65 7.91 days 1978 Jul 5.56	Sphere-cylinder 6570?	7.5 long 2.3 dia	1978 Jun 27.8	51.64	88.82	6597	194	244	0.004	64
D	Soyuz 30 rocket	1978-65B	1978 Jun 27.65 3 days 1978 Jun 30	Cylinder 2500?	7.5 long 2.6 dia	1978 Jun 28.4	51.64	88.53	6583	184	226	0.003	52
T	Cosmos 1024	1978-66A	1978 Jun 28.13 100 years?	Windmill + 6 vanes? 1250?	4.2 long? 1.6 dia	1978 Jun 30.2 1978 Jul 18.2	62.83 62.76	724.73 717.41	26728 26547	605 617	40094 39721	0.739 0.736	318 318
D	Cosmos 1024 launcher rocket	1978-66B	1978 Jun 28.13 33 days 1978 Jul 31	Cylinder 2500?	7.5 long 2.6 dia	1978 Jun 28.2	62.82	92.12	6758	212	547	0.025	124
D	Cosmos 1024 launcher	1978-66C	1978 Jun 28.13 14 days 1978 Jul 12	Irregular	-	Orbit similar to 1978-66B							
	Cosmos 1024 rocket	1978-66D	1978 Jun 28.13 100 years?	Cylinder 440	2.0 long 2.0 dia	Orbit similar to 1978-66A first orbit							
T	Cosmos 1025	1978-67A	1978 Jun 28.73 60 years	-	-	1978 Jul 4.4	82.49	97.84	7032	640	668	0.002	276
	Cosmos 1025 rocket	1978-67B	1978 Jun 28.73 60 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Jun 30.1	82.49	97.81	7031	638	667	0.002	297

* Soyuz 30 docked with Salyut 6 (second airlock) and Soyuz 29 on 1978 Jun 28.71, with one Russian and one Polish cosmonaut: Soyuz 30 undocked 1978 Jul 5.43

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Comstar 1C	1978-68A	1978 Jun 29.93? >million years	Cylinder 1520 full 790 empty	6.32 long 2.36 dia	1978 Jun 30.0 1978 Jul 13.0 1979 Jun 30.0	21.80 0.08 0.0	639.16 1428.15 1436.0	24579 42008 42166	550 35470 35783	35852 35780 35792	0.718 0.004 0	179 - -
	Comstar 1C rocket	1978-68B	1978 Jun 29.93? 6000 years	Cylinder 1815	8.6 long 3.0 dia	Orbit similar to 1978-68A transfer orbit							
D R	Cosmos 1026	1978-69A	1978 Jul 2.40 4.02 days 1978 Jul 6.42	-	-	1978 Jul 2.7	51.78	88.99	6606	207	248	0.003	40
D	Cosmos 1026 rocket	1978-69B	1978 Jul 2.40 5 days 1978 Jul 7	Cylinder 2500?	7.5 long? 2.6 dia?	1978 Jul 2.7	51.78	88.94	6603	206	244	0.003	35
D	Progress 2*	1978-70A	1978 Jul 7.48 27.63 days 1978 Aug 4.11	Sphere-cylinder 7020	7.9 long 2.3 dia	1978 Jul 7.7 1978 Jul 9.2	51.62 51.63	88.60 89.98	6586 6655	182 245	234 308	0.004 0.005	109 210
D	Progress 2 rocket	1978-70B	1978 Jul 7.48 3 days 1978 Jul 10	Cylinder 2500?	7.5 long 2.6 dia	1978 Jul 8.1	51.63	88.62	6587	182	236	0.004	88
T	ESA-GEOS 2	1978-71A	1978 Jul 14.45 >million years	Cylinder 573 full 273 empty	1.10 long 1.62 dia	1978 Jul 14.7 1978 Jul 18.0 1979 Jun 30.0	25.85 0.80 0.2	626.60 1421.17 1436.0	24256 41874 42162	214 35377 35754	35542 35614 35815	0.728 0.003 0.001	179 313 -
D	ESA-GEOS 2 second stage	1978-71B	1978 Jul 14.45 150 days 1978 Dec 11	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1978 Jul 14.5 1978 Jul 14.7	28.73 28.09	88.41 123.80	6574 8232	158 165	233 3543	0.006 0.205	3 40
	ESA-GEOS 2 third stage	1978-71C	1978 Jul 14.45 100 years?	Sphere-cone 66	1.32 long 0.94 dia	1978 Aug 31.6	25.42	626.82	24262	197	35571	0.729	211

*Progress 2 docked with Salyut 6 (2nd airlock) - Soyuz 29 complex on 1978 Jul 9.54; undocked 1978 Aug 2.21. De-orbited over Pacific Ocean two days later.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Molniya 1AS	1978-72A	1978 Jul 14.63 14 years	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1978 Jul 15.7 1978 Jul 24.8	62.83 62.83	736.44 718.15	27015 26566	607 606	40666 39769	0.741 0.737	288 288
D	Molniya 1AS launcher rocket	1978-72B	1978 Jul 14.63 47 days 1978 Aug 30	Cylinder 2500?	7.5 long 2.6 dia	1978 Jul 16.2	62.84	92.66	6784	215	597	0.028	121
D	Molniya 1AS launcher	1978-72C	1978 Jul 14.63 40 days 1978 Aug 23	Irregular	-	1978 Jul 16.2	62.84	92.74	6788	204	616	0.030	116
	Molniya 1AS rocket	1978-72D	1978 Jul 14.63 14 years	Cylinder 440	2.0 long 2.0 dia	Orbit similar to 1978-72A							
T	Statsionar- Raduga 4	1978-73A	1978 Jul 18.92 >million years	-	-	1978 Jul 19.2	0.50	1477.84	42980	36473	36730	0.003	62
D	Raduga 4 launcher rocket	1978-73B	1978 Jul 18.92 2 days 1978 Jul 20	Cylinder 4000?	12 long? 4 dia	1978 Jul 19.2	51.63	88.06	6559	170	192	0.002	281
D	Raduga 4 launcher	1978-73C	1978 Jul 18.92 1 day 1978 Jul 19	Irregular	-	1978 Jul 19.2	51.62	88.00	6556	161	195	0.003	183
	Raduga 4 rocket	1978-73D	1978 Jul 18.92 4½ years	Cylinder 1900?	3.9 long? 3.9 dia	Orbit similar to 1977-71D							

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Cosmos 1027	1978-74A	1978 Jul 27.20 1200 years	Cylinder 700?	1.3 long? 1.9 dia?	1978 Aug 17.4	82.94	104.82	7363	966	1004	0.003	226
	Cosmos 1027 rocket	1978-74B	1978 Jul 27.20 600 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Aug 2.9	82.93	104.71	7358	968	991	0.002	273
T	Satellite Data System 5 [Titan 3B Agena D]	1978-75A	1978 Aug 5.2? 10 years?	Cylinder	-	1978 Aug 31	62.5	697.1	26062	315	39053	0.743	-
	Agena D rocket	1978-75B	1978 Aug 5.2? 10 years?	Cylinder 700?	6 long? 1.5 dia	1978 Aug 21	63.3	700.2	26120	310	39175	0.744	270*
D	Cosmos 1028	1978-76A	1978 Aug 5.63 29.5 days	Sphere-cylinder 6700?	7 long? 2.4 dia	1978 Aug 6.2 1978 Aug 7.8	67.14 67.14	88.66 89.54	6587 6631	170 168	247 337	0.006 0.013	78 65
R			1978 Sep 4.1										
D	Cosmos 1028 rocket	1978-76B	1978 Aug 5.63 2 days 1978 Aug 7	Cylinder 2500?	7.5 long 2.6 dia	1978 Aug 6.2	67.14	88.52	6580	169	234	0.005	87
D	Cosmos 1028 engine	1978-76D	1978 Aug 5.63 30 days 1978 Sep 4	Cone 600? full	1.5 long? 2 dia?	1978 Sep 4.2	67.13	88.88	6598	149	290	0.011	69
D	Fragment	1978-76C											

* USAF payload launched from Vandenberg, California. Orbit and launch time unconfirmed.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Progress 3*	1978-77A	1978 Aug 7.94 15.84 days 1978 Aug 23.78	Sphere-cylinder 7020	7.9 long 2.3 dia	1978 Aug 8.2 1978 Aug 9.6 1978 Aug 21.7	51.64 51.63 51.62	88.66 89.36 91.35	6589 6624 6722	190 243 335	232 249 352	0.003 0.0004 0.001	77 334 256
D	Progress 3 rocket	1978-77B	1978 Aug 7.94 2 days 1978 Aug 9	Cylinder 2500?	7.5 long 2.6 dia	1978 Aug 8.1	51.64	88.55	6584	185	226	0.003	77
D	Pioneer Venus 2 Atlas stage	1978-78B	1978 Aug 8.31 < 0.7 day 1978 Aug 8	Cylinder 3400	20 long 3.0 dia	1978 Aug 8.3	28.6?	87.5?	6536?	150?	165?	0.001?	-
T	ISEE 3	1978-79A	1978 Aug 12.63 Indefinite	Cylinder 469 full	1.61 long 1.73 dia	1978 Aug 12.7	28.89	73702	582300	180	1151664	0.989	320**
D	ISEE 3 second stage	1978-79B	1978 Aug 12.63 72 days 1978 Oct 23	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1978 Aug 13.9	28.73	100.86	7184	176	1436	0.088	327
	ISEE 3 third stage	1978-79D	1978 Aug 12.63 Indefinite	Sphere - cone 66	1.32 long 0.94 dia	Orbit similar to 1978-79A transfer orbit							
	Fragment	1978-79C											
T	Molniya 1 AT	1978-80A	1978 Aug 22.99 18½ years	Windmill +6 vanes 1000?	3.4 long 1.6 dia	1978 Aug 23.6 1978 Aug 29.7	62.87 62.83	735.68 718.23	26996 26568	443 464	40793 39915	0.747 0.743	280 280

* Progress 3 docked with Salyut 6 (2nd airlock) - Soyuz 29 complex on 1978 Aug 10.00; undocked 1978 Aug 21 and later de-orbited over Pacific Ocean.

**To enter heliocentric orbit - a 'halo' orbit around the Sun-Earth/Moon libration point, at distance of 1.6 million km from Earth on Earth-Sun line.

Space Vehicle: Pioneer Venus 2 (1978-78A), and Centaur rocket (1978-78C).

1978-80 continued on page 543

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Molniya 1 AT launcher rocket	1978-80B	1978 Aug 22.99 24 days 1978 Sep 15	Cylinder 2500?	7.5 long 2.6 dia	1978 Aug 23.9	62.81	90.95	6700	190	454	0.020	114
D	Molniya 1 AT launcher	1978-80C	1978 Aug 22.99 15 days 1978 Sep 6	Irregular	-	1978 Aug 24.5	62.82	91.01	6703	211	439	0.017	124
	Molniya 1 AT rocket	1978-80D	1978 Aug 22.99 18½ years	Cylinder 440	2.0 long 2.0 dia	Orbit similar to 1978-80A							
D	Soyuz 31*	1978-81A	1978 Aug 26.62	Sphere-cylinder 6570?	7.5 long 2.3 dia	1978 Aug 26.8	51.62	88.80	6596	193	243	0.004	62
2M			67.84 days			1978 Aug 27.1	51.63	90.23	6667	256	322	0.005	281
R			1978 Nov 2.46			1978 Aug 28.4	51.63	91.40	6725	339	354	0.001	306
D	Soyuz 31 rocket	1978-81B	1978 Aug 26.62 2 days 1978 Aug 28	Cylinder 2500?	7.5 long 2.6 dia	1978 Aug 27.1	51.62	88.64	6588	191	229	0.003	57
D	Cosmos 1029	1978-82A	1978 Aug 29.63	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1978 Aug 30.7	62.81	89.57	6633	179	330	0.011	76
R			9.68 days 1978 Sep 8.31			1978 Aug 31.2	62.81	89.33	6621	171	314	0.011	63
D	Cosmos 1029 rocket	1978-82B	1978 Aug 29.63 5 days 1978 Sep 3	Cylinder 2500?	7.5 long 2.6 dia	1978 Aug 31.0	62.80	89.21	6615	173	300	0.010	72
D	Cosmos 1029	1978-82C	1978 Aug 29.63	Cone	1.5 long?	1978 Sep 8.1	62.81	89.46	6628	168	332	0.012	70
P	engine†		13.07 days 1978 Sep 11.70	600? full	2 dia?								
D	Fragment	1978-82D											

† A 20kg, 0.6m piece was picked up near Garnat-sur-Engievre (Allier), France

* Soyuz 31 docked with Salyut 6 (2nd airlock) and Soyuz 29 on 1978 Aug 27.69, with one Russian and one East German cosmonaut. The crew returned to Earth in Soyuz 29, undocking 1978 Sep 3 (see page 536). Soyuz 31 (piloted by Soyuz 29 crew) undocked from 2nd airlock and re-docked with 1st airlock 1978 Sep 7. Soyuz 31 finally undocked from Salyut 6 on 1978 Nov 2.32, landing the Soyuz 29 crew with a duration record for manned space flight of 139.61 days.

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Cosmos 1030	1978-83A	1978 Sep 6.13 25 years	Windmill + 6 vanes? 1250?	4.2 long? 1.6 dia	1978 Sep 9.2 1978 Sep 19.2	62.80 62.80	725.64 719.16	26749 26591	613 654	40129 39771	0.739 0.735	318 318
D	Cosmos 1030 launcher rocket	1978-83B	1978 Sep 6.13 32 days 1978 Oct 8	Cylinder 2500?	7.5 long 2.6 dia	1978 Sep 6.2	62.79	92.51	6777	213	585	0.027	121
D	Cosmos 1030 launcher	1[illegible]C	1978 Sep 6.13 15 days 1978 Sep 21	Irregular	-	1978 Sep 6.4	62.87	92.48	6776	173	622	0.033	119
	Cosmos 1030 rocket	1978-83D	1978 Sep 6.13 25 years	Cylinder 440	2.0 long 2.0 dia	1978 Oct 1.3	62.97	723.36	26693	605	40025	0.738	318
D	Venus 11* launcher	1978-84C	1978 Sep 9.15 1 day 1978 Sep 10	Irregular	-	1978 Sep 9.3	51.55	88.19	6566	170	205	0.003	0
D	Cosmos 1031	1978-85A	1978 Sep 9.63 12.60 days 1978 Sep 22.23	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1978 Sep 10.2 1978 Sep 11.2	62.82 62.82	89.59 89.33	6634 6621	182 171	329 314	0.011 0.011	82 83
R													
D	Cosmos 1031 rocket	1978-85B	1978 Sep 9.63 5 days 1978 Sep 14	Cylinder 2500?	7.5 long 2.6 dia	1978 Sep 10.1	62.81	89.47	6628	178	321	0.011	80
D	Cosmos 1031 engine	1978-85D	1978 Sep 9.63 15 days 1978 Sep 24	Cone 600? full	1.5 long? 2 dia?	1978 Sep 22.1	62.82	89.12	6610	161	303	0.011	74
D	Fragment	1978-85C											

Space Vehicle: Venus 11 (1978-84A)

* Venus 11 launcher rocket, similar to 1976-81D, was designated 1978-84B

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Venus 12* launcher	1978-86B	1978 Sep 14.11 1 day 1978 Sep 15	Irregular	-	1978 Sep 14.3	51.51	88.15	6564	164	207	0.003	0
T	Jikiken (EXOS B)	1978-87A	1978 Sep 16.21 20 years	12-sided polygon 70	-	1978 Sep 16.4	31.09	532.85	21772	230	30558	0.697	-
	Jikiken rocket [Mu-3H]	1978-87B	1978 Sep 16.21 20 years	Cylinder?	-	1979 Jan 1.0	31.1	517.9	21363	215	29754	0.691	-
D R	Cosmos 1032	1978-88A	1978 Sep 19.34 12.83 days 1978 Oct 2.17	Sphere-cylinder 5900?	5.9 long 2.4 dia	1978 Sep 19.9	81.34	88.93	6599	215	226	0.001	59
D	Cosmos 1032 rocket	1978-88B	1978 Sep 19.34 3 days 1978 Sep 22	Cylinder 2500?	7.5 long 2.6 dia	1978 Sep 19.9	81.35	88.73	6589	204	217	0.001	329
D	Fragments**	1978-88C,D											
D R	Cosmos 1033	1978-89A	1978 Oct 3.46 12.84 days 1978 Oct 16.30	Sphere-cylinder 5900?	5.9 long 2.4 dia	1978 Oct 6.4	81.37	88.95	6600	212	231	0.001	102
D	Cosmos 1033 rocket	1978-89B	1978 Oct 3.46 3 days 1978 Oct 6	Cylinder 2500?	7.5 long 2.6 dia	1978 Oct 3.8	81.37	88.92	6599	206	235	0.002	118
D	Capsule	1978-89C	1978 Oct 3.46 14 days 1978 Oct 17	Ellipsoid 200?	0.9 long 1.9 dia	1978 Oct 15.3	81.36	88.43	6574	189	202	0.001	64

Space Vehicle: Venus 12 (1978-86A)

* Venus 12 launcher rocket, similar to 1976-81D, was apparently not tracked or designated.

** Object 1978-88D was a capsule; it decayed 1978 Oct 3, life 14 days.

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Progress 4*	1978-90A	1978 Oct 3.96 22.74 days 1978 Oct 26.70	Sphere-cylinder 7020	7.9 long 2.3 dia	1978 Oct 4.2 1978 Oct 7.5 1978 Oct 21.8	51.65 51.64 51.64	88.75 91.19 91.68	6594 6714 6739	185 325 359	247 347 362	0.005 0.002 0.0002	98 81 338
D	Progress 4 rocket	1978-90B	1978 Oct 3.96 2 days 1978 Oct 5	Cylinder 2500?	7.5 long 2.6 dia	1978 Oct 4.1	51.65	88.66	6590	184	239	0.004	97
T	Cosmos 1034	1978-91A	1978 Oct 4.16 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Oct 4.7	74.03	114.97	7832	1423	1484	0.004	110
T	Cosmos 1035	1978-91B	1978 Oct 4.16 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Oct 8.8	74.03	114.74	7822	1405	1482	0.005	90
T	Cosmos 1036	1978-91C	1978 Oct 4.16 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Oct 4.7	74.04	115.19	7842	1443	1484	0.003	114
T	Cosmos 1037	1978-91D	1978 Oct 4.16 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Oct 8.9	74.03	115.41	7852	1463	1484	0.001	123
T	Cosmos 1038	1978-91E	1978 Oct 4.16 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Oct 8.9	74.03	115.64	7862	1480	1488	0.001	202
T	Cosmos 1039	1978-91F	1978 Oct 4.16 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Oct 8.9	74.03	116.38	7896	1481	1554	0.005	252

*Progress 4 docked with Salyut 6 (2nd airlock) - Soyuz 31 complex on 1978 Oct 6.04; undocked 1978 Oct 24.55 and later de-orbited over Pacific Ocean.

1978-91 continued on page 547

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Cosmos 1040	1978-91G	1978 Oct 4.16 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Oct 8.9	74.03	116.11	7883	1481	1529	0.003	257
T	Cosmos 1041	1978-91H	1978 Oct 4.16 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Oct 7.8	74.03	115.88	7873	1480	1510	0.002	235
	Cosmos 1034 rocket	1978-91J	1978 Oct 4.16 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Oct 8.9	74.04	118.06	7972	1484	1703	0.014	266
D R	Cosmos 1042	1978-92A	1978 Oct 6.65 12.64 days 1978 Oct 19.29	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1978 Oct 8.9	62.80	89.26	6617	179	299	0.009	72
D	Cosmos 1042 rocket	1978-92B	1978 Oct 6.65 4 days 1978 Oct 10	Cylinder 2500?	7.5 long 2.6 dia	1978 Oct 7.7	62.79	88.99	6604	174	277	0.008	67
D	Cosmos 1042 engine?	1978-92C	1978 Oct 6.65 15 days 1978 Oct 21	Cone 600? full	1.5 long? 2 dia?		Similar to 1978-92A orbit						
D	Fragment	1978-92D											
T	Navstar 3 (GPS)	1978-93A	1978 Oct 7.02 1 million years	Cylinder + 4 vanes 433	-	1978 Oct 17.1	62.81	722.61	26677	20285	20312	0.0005	127
	Navstar 3 rocket [Atlas F]	1978-93B	1978 Oct 7.02 30 years	Cone-cylinder? 163?	1.85 long? 0.63 tc 1.65 dia?	1978 Oct 7.4	62.95	350.79	16477	158	20040	0.603	159

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T?	Cosmos 1043	1978-94A	1978 Oct. 10.82 60 years	Cylinder + 2 vanes? 2500?	5 long? 1.5 dia?	1978 Oct 12.9	81.20	97.31	7007	622	635	0.001	301
	Cosmos 1043 rocket	1978-94B	1978 Oct 10.82 60 years	Cylinder 1440	3.8 long 2.6 dia	1978 Oct 14.5	81.21	97.38	7010	579	685	0.008	178
T	Molniya 3K	1978-95A	1978 Oct 13.22 25 years *	Windmill + 6 vanes 1500?	4.2 long? 1.6 dia	1978 Oct 13.8 1978 Oct 24.9	62.79 62.82	736.21 717.66	27009 26554	432 424	40829 39928	0.748 0.744	280 280
D	Molniya 3K launcher rocket	1978-95B	1978 Oct 13.22 15 days 1978 Oct 28	Cylinder 2500?	7.5 long 2.6 dia	1978 Oct 14.5	62.82	90.97	6701	213	433	0.016	127
D	Molniya 3K launcher	1978-95C	1978 Oct 13.22 7 days 1978 Oct 20	Irregular	-	1978 Oct 14.5	62.79	90.47	6677	175	422	0.019	114
	Molniya 3K rocket	1978-95E	1978 Oct 13.22 25 years *	Cylinder 440	2.0 long 2.0 dia	1979 Jun 30.0	63.2	734.5	26967	397	40781	0.749	-
D	Fragment	1978-95D											
T	Tiros 11	1978-96A	1978 Oct 13.47 500 years	Cylinder 734	3.71 long 1.88 dia	1978 Oct 16.7	98.91	102.12	7236	850	866	0.001	256
	Tiros 11 rocket [Atlas F]	1978-96B	1978 Oct 13.47 400 years	- 682 full?	-	1978 Oct 14.4	98.91	102.11	7236	855	860	0.0003	292
	Fragment	1978-96C											

* Decay possible in 1994 when perigee falls to 200 km

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 1044	1978-97A	1978 Oct 17.63 12.65 days 1978 Oct 30.28	Sphere-cylinder 5700?	5.0 long 2.4 dia	1978 Oct 18.4	62.82	89.46	6627	203	295	0.007	69
D	Cosmos 1044 rocket	1978-97B	1978 Oct 17.63 5 days 1978 Oct 22	Cylinder 2500?	7.5 long 2.6 dia	1978 Oct 18.4	62.82	89.30	6619	211	271	0.005	78
D	Fragments	1978-97C-E											
T	Nimbus 7	1978-98A	1978 Oct 24.34 1000 years	Conical skeleton? 832?	3 long 2 dia	1978 Oct 26.0	99.29	104.08	7327	943	953	0.0007	240
	Nimbus 7 second stage*	1978-98B	1978 Oct 24.34 500 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1978 Oct 26.3	99.28	104.08	7327	943	953	0.0007	252
T	Intercosmos 18 (Magic)**	1978-99A	1978 Oct 24.79 3 years	Octagonal ellipsoid 550?	1.8 long? 1.5 dia?	1978 Oct 25.5	82.97	96.40	6963	406	764	0.026	166
	Intercosmos 18 rocket	1978-99B	1978 Oct 24.79 2 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Oct 29.1	82.96	96.30	6958	403	757	0.025	153
T	Magion 1†	1978-99C	1978 Oct 24.79 4 years	Prism 15	0.30 x 0.30 x 0.15	1978 Nov 17.5	82.95	96.36	6961	404	762	0.026	89

* Carried CAMEO - Chemically active materials ejected in orbit (Barium released 1978 Oct 29, and Lithium released 1978 Nov 6). Weight 89 kg.

† Czechoslovak MAGnetospheric and IONospheric satellite, ejected from Intercosmos 18 on 1978 Nov 14.74 ** Magnetospheric Intercosmos.

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Cosmos 1045	1978-100A	1978 Oct 26.29 15000 years	-	-	1978 Oct 29.1	82.55	120.41	8078	1689	1710	0.001	173
T	Radio 1	1978-100B	1978 Oct 26.29 15000 years	-	-	1978 Oct 29.1	82.55	120.39	8077	1688	1709	0.001	183
T	Radio 2	1978-100C	1978 Oct 26.29 15000 years	Cylinder + bar 40	0.39 long 0.42 dia	1978 Oct 28.6	82.55	120.40	8077	1689	1709	0.001	181
	Cosmos 1045 rocket	1978-100D	1978 Oct 26.29 15000 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Oct 30.1	82.55	120.35	8075	1688	1705	0.001	175
	Fragment	1978-100E											
T	Prognoz 7	1978-101A	1978 Oct 30.23 2 years	Spheroid + 4 vanes 915?	1.8 dia?	1978 Oct 30.2	64.91	5881.1	107928	472	202627	0.937	290
D	Prognoz 7 launcher rocket	1978-101B	1978 Oct 30.23 18 days 1978 Nov 17	Cylinder 2500?	7.5 long 2.6 dia	1978 Nov 4.9	65.02	90.79	6692	206	422	0.016	59
D	Prognoz 7 launcher	1978-101C	1978 Oct 30.23 26 days 1978 Nov 25	Irregular	-	1978 Nov 4.9	64.99	91.13	6709	233	429	0.015	63
	Prognoz 7 rocket	1978-101D	1978 Oct 30.23 2 years	Cylinder 440	2.0 long 2.0 dia	Orbit similar to 1978-101A							

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 1046	1978-102A	1978 Nov 1.50 11.78 days 1978 Nov 13.28	Sphere-cylinder 5900?	5.9 long 2.4 dia	1978 Nov 5.2	72.86	89.77	6641	202	324	0.009	62
D	Cosmos 1046 rocket	1978-102B	1978 Nov 1.50 6 days 1978 Nov 7	Cylinder 2500?	7.5 long 2.6 dia	1978 Nov 5.4	72.86	88.83	6595	180	253	0.000	50
D	Capsule	1978-102D	1978 Nov 1.50 14 days 1978 Nov 15	Ellipsoid 200?	0.9 long 1.9 dia	Orbit similar to 1978-102A							
D	Fragments	1978-102C,E-G											
T	HEAO 2	1978-103A	1978 Nov 13.23 9 years	Hexagonal cylinder 2720	5.8 long 2.4 dia	1978 Nov 17.2	23.51	95.07	6909	520	541	0.002	345
D	HEAO 2 rocket	1978-103B	1978 Nov 13.23 120 days 1979 Mar 13	Cylinder 1815	8.6 long 3.0 dia	1978 Nov 18.0	23.51	92.86	6801	379	467	0.006	10
D R	Cosmos 1047	1978-104A	1978 Nov 15.49 12.77 days 1978 Nov 28.26	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1978 Nov 15.5	72.86	89.77	6641	171	354	0.014	80
D	Cosmos 1047 rocket	1978-104B	1978 Nov 15.49 4 days 1978 Nov 19	Cylinder 2500?	7.5 long 2.6 dia	1978 Nov 18.0	72.86	88.85	6595	160	274	0.009	69
D	Cosmos 1047 engine	1978-104C	1978 Nov 15.49 17 days 1978 Dec 2	Cone 600? full	1.5 long? 2 dia?	Orbit similar to 1978-104A							

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Cosmos 1048	1978-105A	1978 Nov 16.91 120 years	Cylinder + paddles? 750?	2 long? 1 dia?	1978 Nov 17.1	74.03	100.89	7179	785	816	0.002	350
	Cosmos 1048 rocket	1978-105B	1978 Nov 16.91 100 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Nov 17.1	74.04	100.81	7175	777	816	0.003	358
	Fragments	1978-105C,D											
T	NATO 3C	1978-106A	1978 Nov 19.04 > million years	Cylinder 706 full 346 empty	2.23 long 2.18 dia	1978 Nov 19.1 1978 Nov 30.2	27.20 4.41	632.80 1428.6	24416 42020	185 35516	35890 35768	0.731 0.003	171 217
D	NATO 3C second stage	1978-106B	1978 Nov 19.04 23 days 1978 Dec 12	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1978 Nov 21.1	28.24	93.50	6831	174	732	0.041	179
	NATO 3C third stage	1978-106C	1978 Nov 19.04 2 years?	Sphere - cone 66	1.32 long 0.94 dia	Orbit similar to 1978-106A transfer orbit							
D R	Cosmos 1049	1978-107A	1978 Nov 21.50 12.76 days 1978 Dec 4.26	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1978 Nov 22.8 1978 Nov 26.2	72.86 72.86	89.59 89.65	6632 6635	169 169	338 344	0.013 0.013	80 71
D	Cosmos 1049 rocket	1978-107B	1978 Nov 21.50 5 days 1978 Nov 26	Cylinder 2500?	7.5 long 2.6 dia	1978 Nov 21.7	72.86	89.56	6630	169	335	0.012	82
D	Cosmos 1049 engine	1978-107E	1978 Nov 21.50 20 days 1978 Dec 11	Cone 600? full	1.5 long? 2 dia?	Orbit similar to 1978-107A							
D	Fragments	1978-107C,D											

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 1050	1978-108A	1978 Nov 28.68	Sphere-cylinder	6.5 long?	1978 Nov 30.1	62.80	89.81	6644	254	278	0.002	126
R			13.62 days	6300?	2.4 dia	1978 Dec 3.2	62.80	89.43	6625	224	270	0.003	77
			1978 Dec 12.30										
D	Cosmos 1050 rocket	1978-108B	1978 Nov 28.68	Cylinder	7.5 long	1978 Dec 2.7	62.79	89.41	6624	240	252	0.001	73
			10 days	2500?	2.6 dia								
			1978 Dec 8										
D	Cosmos 1050 engine	1978-108E	1978 Nov 28.68	Cone	1.5 long?	1978 Dec 12.2	62.80	89.07	6607	160	298	0.011	230
			17 days	600? full	2 dia?								
			1978 Dec 15										
D	Fragments	1978-108C, D											
T	Cosmos 1051	1978-109A	1978 Dec 5.76	Spheroid	1.0 long?	1978 Dec 8.4	74.02	114.72	7820	1397	1487	0.006	102
			7000 years	40?	0.8 dia?								
T	Cosmos 1052	1978-109B	1978 Dec 5.76	Spheroid	1.0 long?	1978 Dec 6.1	74.02	114.92	7829	1412	1490	0.005	117
			8000 years	40?	0.8 dia?								
T	Cosmos 1053	1978-109C	1978 Dec 5.76	Spheroid	1.0 long	1978 Dec 8.3	74.02	115.12	7839	1433	1488	0.003	119
			9000 years	40?	0.8 dia?								
T	Cosmos 1054	1978-109D	1978 Dec 5.76	Spheroid	1.0 long?	1978 Dec 9.2	74.02	115.33	7848	1449	1491	0.003	129
			9000 years	40?	0.8 dia?								
T	Cosmos 1055	1978-109E	1978 Dec 5.76	Spheroid	1.0 long?	1978 Dec 8.2	74.02	115.5	7858	1460	1500	0.002	160
			10000 years	40?	0.8 dia?								
T	Cosmos 1056	1978-109F	1978 Dec 5.76	Spheroid	1.0 long?	1978 Dec 8.3	74.02	115.77	7868	1472	1508	0.002	197
			10000 years	40?	0.8 dia?								

1978-109 continued on page 554

Year of launch 1978 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Cosmos 1057	1978-109G	1978 Dec 5.76 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Dec 8.3	74.02	115.99	7878	1482	1518	0.002	231
T	Cosmos 1058	1978-109H	1978 Dec 5.76 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1978 Dec 9.2	74.02	116.24	7889	1481	1541	0.004	236
	Cosmos 1051 rocket	1978-109J	1978 Dec 5.76 20000 years	Cylinder 2200?	7.4 long 2.4 dia		Orbit similar to 1978-91J						
D R	Cosmos 1059	1978-110A	1978 Dec 7.65 12.63 days 1978 Dec 20.28	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1978 Dec 7.8 1978 Dec 9.4	62.81 62.81	89.67 89.35	6637 6621	180 172	338 314	0.012 0.011	80 72
D	Cosmos 1059 rocket	1978-110B	1978 Dec 7.65 4 days 1978 Dec 11	Cylinder 2500?	7.5 long 2.6 dia	1978 Dec 7.8	62.80	89.53	6630	177	327	0.011	77
D	Cosmos 1059 engine	1978-110C	1978 Dec 7.65 16 days 1978 Dec 23	Cone 600? full	1.5 long? 2 dia?	1978 Dec 19.4	62.84	89.76	6642	168	359	0.014	66
D	Fragment	1978-110D											
D R	Cosmos 1060	1978-111A	1978 Dec 8.40 12.8 days 1978 Dec 21.2	Sphere-cylinder 5700?	5.0 long 2.4 dia	1978 Dec 8.5	65.03	89.47	6627	206	292	0.006	53
D	Cosmos 1060 rocket	1978-111B	1978 Dec 8.40 5 days 1978 Dec 13	Cylinder 2500?	7.5 long 2.6 dia	1978 Dec 8.5	65.03	89.32	6620	201	282	0.006	36

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Navstar 4	1978-112A	1978 Dec 11.18 1 million years	Cylinder + 4 vanes 433	-	1978 Dec 14.2	63.27	722.38	26670	20267	20316	0.001	88
	Navstar 4 rocket [Atlas F]	1978-112B	1978 Dec 11.18 30 years	Cone-cylinder? 163?	1.85 long? 0.63 to 1.65 dia?	1978 Dec 13.8	63.09	349.31	16431	120	19986	0.605	162
T	DSCS 11*	1978-113A	1978 Dec 14.03 > million years	Cylinder + 2 dishes 590	1.83 long 2.74 dia	1978 Dec 14.8 1979 Mar 7.7	2.49 2.27	1452.2 1436.2	42482 42168	35796 35784	36412 35796	0.007 0.0001	2 204
T	DSCS 12	1978-113B	1978 Dec 14.03 > million years	Cylinder + 2 dishes 590	1.83 long 2.74 dia	1978 Dec 14.8 1979 Feb 28.8	2.50 2.30	1464.3 1436.0	42715 42164	36261 35776	36413 35796	0.002 0.0002	352 268
D	Titan 3C second stage	1978-113C	1978 Dec 14.03 <1 day 1978 Dec 14	Cylinder 1900	6 long 3.0 dia	1978 Dec 14.6	28.59	87.90	6556	150	206	0.004	121
	Transtage	1978-113D	1978 Dec 14.03 > million years	Cylinder 1500?	6 long? 3.0 dia	1978 Dec 14.8	2.50	1452.0	42478	35788	36412	0.007	2
D R	Cosmos 1061	1978-114A	1978 Dec 14.64 12.63 days 1978 Dec 27.27	Sphere-cylinder 5900?	5.9 long 2.4 dia	1978 Dec 15.6	62.82	89.62	6635	203	310	0.008	78
D	Cosmos 1061 rocket	1978-114B	1978 Dec 14.64 6 days 1978 Dec 20	Cylinder 2500?	7.5 long 2.6 dia	1978 Dec 15.1	62.81	89.42	6625	200	293	0.007	73

* DSCS 9 and 10 failed to reach orbit in 1978 March.

1978-114 continued on page 556

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Capsule	1978-114C	1978 Dec 14.64 21 days 1979 Jan 4	Ellipsoid 200?	0.9 long 1.9 dia	Orbit similar to 1978-114A							
T	Cosmos 1062	1978-115A	1978 Dec 15.56 9 years	Cylinder + paddles? 900?	2 long? 1 dia?	1978 Dec 16.9	74.04	95.18	6905	504	550	0.003	350
	Cosmos 1062 rocket	1978-115B	1978 Dec 15.56 9 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Dec 16.9	74.04	95.09	6901	494	551	0.004	357
D	Fragment	1978-115C											
T	Telesat 4 (Anik)	1978-116A	1978 Dec 16.01 > million years	Box + vanes 922 full 474 empty	2.14 high 2.17 square	1978 Dec 16.0 1979 Jan 31.6	27.25 0.03	632.91 1435.9	24419 42164	185 35781	35896 35790	0.731 0.0001	178 58
D	Telesat 4 second stage (DRIMS)*	1978-116B	1978 Dec 16.01 128 days 1979 Apr 23	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1978 Dec 16.7	28.42	107.68	7504	183	2069	0.126	181
	Telesat 4 third stage	1978-116C	1978 Dec 16.01 20 years?	Sphere-cone 66	1.8 long 0.94 dia	Orbit similar to 1978-116A transfer orbit							
T	Cosmos 1063	1978-117A	1978 Dec 19.07 60 years	Cylinder + 2 vanes? 2500?	5 long? 1.5 dia?	1978 Dec 21.8	81.23	97.38	7011	631	634	0.0002	55
	Cosmos 1063 rocket	1978-117B	1978 Dec 19.07 60 years	Cylinder 1440	3.8 long 2.6 dia	1978 Dec 22.0	81.24	97.44	7014	581	690	0.008	170

*Delta Redundant Inertial Measurement Systems

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Gorizont 1	1978-118A	1978 Dec 19.52 > million years	-	-	1978 Dec 20.4 1979 Jun 30.0	11.3 11.3	1420 1436.1	41850 42166	22580 22553	48365 49023	0.308 0.314	70 -
D	Gorizont 1 launcher rocket*	1978-118B	1978 Dec 19.52 2 days 1978 Dec 21	Cylinder 4000?	12 long? 4 dia	1978 Dec 20.1	51.61	88.08	6560	174	190	0.001	206
D	Gorizont 1 rocket	1978-118C	1978 Dec 19.52 1 year?	Cylinder 1900?	3.9 long? 3.9 dia	Orbit similar to 1978-73D							
T	Cosmos 1064	1978-119A	1978 Dec 20.87 8 years	Octagonal ellipsoid? 550?	1.8 long? 1.5 dia?	1978 Dec 21.9	82.95	98.69	7073	424	965	0.038	99
	Cosmos 1064 rocket	1978-119B	1978 Dec 20.87 7 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Dec 21.2	82.95	98.58	7067	416	962	0.039	102
D	Cosmos 1065	1978-120A	1978 Dec 22.92 222 days 1979 Aug 1	Octagonal ellipsoid? 550?	1.8 long? 1.5 dia?	1978 Dec 24.3	50.68	93.45	6824	344	548	0.015	151
D	Cosmos 1065 rocket	1978-120B	1978 Dec 22.92 239 days 1979 Aug 18	Cylinder 2200?	7.4 long 2.4 dia	1978 Dec 23.0	50.68	93.41	6822	344	544	0.015	144
D	Fragments	1978-120C-H											
T?	Cosmos 1066**	1978-121A	1978 Dec 23.37 500 years	Cylinder + 2 vanes? 2200?	5 long? 1.5 dia?	1978 Dec 23.5	81.24	102.05	7233	818	891	0.005	272
	Cosmos 1066 rocket	1978-121B	1978 Dec 23.37 400 years	Cylinder 1440	3.8 long 2.6 dia	1978 Dec 23.6	81.25	102.10	7235	816	898	0.006	246

*There may have been a launch platform in a similar orbit

**Possibly an attempted Meteor satellite?

Year of launch 1978 concluded

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Cosmos 1067	1978-122A	1978 Dec 26.56 3000 years	Spheroid + paddles? 650?	1.6 dia?	1978 Dec 26.8	82.97	109.07	7561	1158	1208	0.003	267
	Cosmos 1067 rocket	1978-122B	1978 Dec 26.56 2000 years	Cylinder 2200?	7.4 long 2.4 dia	1978 Dec 26.7	82.97	108.95	7555	1157	1197	0.003	256
D	Cosmos 1068	1978-123A	1978 Dec 26.65	Sphere-cylinder	6.5 long?	1978 Dec 26.9	62.80	90.17	6662	177	391	0.016	74
R			12.6 days 1979 Jan 8.3	6300?	2.4 dia	1978 Dec 27.6	62.80	89.40	6624	173	318	0.011	64
D P	Cosmos 1068 rocket *	1978-123B	1978 Dec 26.65 5.15 days 1978 Dec 31.80	Cylinder 2500?	7.5 long 2.6 dia	1978 Dec 27.1	62.78	89.92	6650	174	369	0.015	71
D	Cosmos 1068 engine	1978-123D	1978 Dec 26.65 14 days 1979 Jan 9	Cone 600? full	1.5 long? 2 dia?	1979 Jan 6.7	62.80	89.38	6623	166	324	0.012	62
D	Fragments	1978-123C,E											
D R	Cosmos 1069	1978-124A	1978 Dec 28.69 12.64 days 1979 Jan 10.33	Sphere-cylinder 5900?	5.9 long 2.4 dia	1978 Dec 29.5	62.82	89.75	6641	241	285	0.003	188
D	Cosmos 1069 rocket	1978-124B	1978 Dec 28.69 8 days 1979 Jan 5	Cylinder 2500?	7.5 long 2.6 dia	1978 Dec 29.5	62.82	89.62	6635	241	272	0.002	193
D	Capsule	1978-124F	1978 Dec 28.69 25 days 1979 Jan 22	Ellipsoid 200?	0.9 long 1.9 dia	Orbit similar to 1978-124A							
D	Fragments	1978-124C-E											

* Pieces found near Hannover

INDEX TO TABLE OF EARTH SATELLITES, VOLUME 3: 1974 TO 1978

* These Cosmos satellites ejected a capsule.

* These Cosmos satellites ejected a capsule

* These Cosmos satellites ejected a capsule

* These Cosmos satellites ejected a capsule

* Subgroups: (C) Calibration and diagnostic; (I) Interceptor; (T) Target.

REPORT DOCUMENTATION PAGE

Overall security classification of this page

UNLIMITED

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17. Abstract

The RAE Table of satellites at present runs to nearly 600 pages, and is divided into four volumes. Volume 1, with satellites launched in the years 1957-1968, was issued in revised form in 1978. Volume 2, covering the years 1969-1973, was issued in revised form early in 1979. Volume 3, with satellites launched in the years 1974-1978, is now issued for the first time and brings together the 60 monthly issues for these years, with appropriate amendments. Satellites launched in 1979 will appear in Volume 4, Part 1.

The present volume lists 607 launches, arranged chronologically, giving the name and international designation of each instrumented satellite and its associated rocket(s), with the date of launch, lifetime (actual or estimated), mass, shape, dimensions and at least one set of orbital parameters. Other fragments associated with a launch are listed, without details.

The main Table, which occupies 203 pages, is prefaced by six pages of introduction and explanation, and followed by a six-page index.

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